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Birds of an Earthquake Lake

By KARL MASLOWSKI

Photographs by the Author

WARD'S HERONS, STANDING OUTLINED AGAINST THE SKY, LENT A TOUCH AS OF THE FAR EAST TO THE SCENE

THE FEW hardy pioneers who had pushed westward six hundred miles across Tennessee to settle at the great bend in the Mississippi River at New Madrid one hundred and twenty-five years ago were all sound asleep. It was a night in early December. Already a beady-eyed barred owl was serenading his love with a deep-toned concert that was more chilling than warming to the other forest folk below. Suddenly a slight tremor shook the mighty cypress tree from which he called. The tremor stilled his hooting, and he twitched his tail and wings to regain the balance he had almost lost. His oval-shaped head twisted slowly from side to side, seeking the cause of the disturbance. Had he looked down to the base of the tree, he would have seen slight cracks widening to foot-wide chasms. Then, without further warning, the stillness of the winter's night was shattered by a rumbling and crashing. The tree fairly splintered from beneath the owl's talons.

Terrified hunters, traders, and farmers poured from their quivering cabins shouting, "Earthquake, earthquake!" And earthquake it was, for the light of the following dawn showed great rents in the earth's crust, and all about lay twisted and broken trees and branches.

So began the formation of one of the world's most remarkable bodies of water—Reelfoot Lake, "The Earthquake Lake." We say "began", since that first shock in December, 1811, was followed by recurrent ones until April, 1812. With each one new fissures were torn in the soil, from which poured water, gravel, and stone coal accompanied by a gaseous odor that filled the air almost to the

A GROUP OF DOUBLE-CRESTED CORMORANTS NESTED TOGETHER WITH AN APPEARANCE OF EXCLUSIVENESS THAT EARNED FOR THE COLONY THE NAME "CORMORANT RIDGE"

point of suffocation. The final result of that series of quakes was a body of water of about 40,000 acres, roughly two miles wide by twelve miles long.

The beaver is often credited with being our best agent in the building of favorable habitats for other animals. In one case, at least, the prize goes to an earthquake, for today Reelfoot Lake is a focal point for one of the richest concentrations of flora and fauna in the eastern United States.

It was three years ago that I first glimpsed something of the plant and animal life that go to make up the natural history of Reelfoot Lake. I spent a day exploring its stump-studded surface (a grim reminder of the earthquake), its wide, wild marshes, and its lofty stands of cypress trees. The few short hours I spent in the great heronry on the west shore left me with a desire to return some day with my cameras to record the happenings in that vast colony of birds. As I left the lake that evening the cackle, gabble and twittering of least bitterns, gallinules, red-wings and least terns made the desire only stronger.

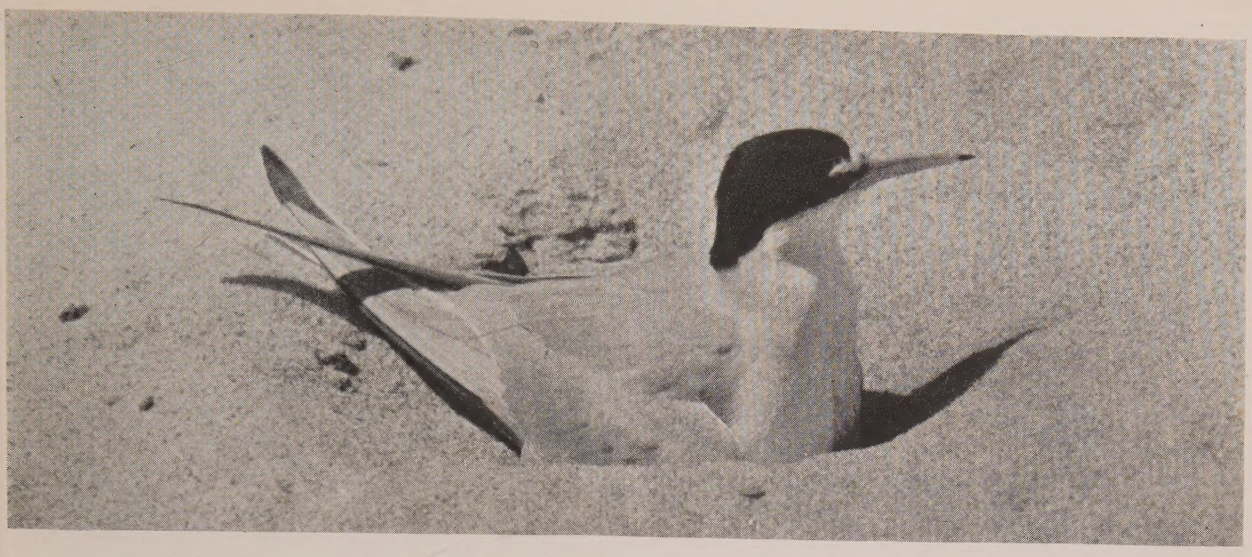
Early June, 1937, found me once more at Reelfoot Lake, this time prepared to stay with cameras and binoculars until I should have my fill of the lake's attractions. I was particularly interested in photographing the birds of "Cranetown." This heronry on Big Ronaldson Slough is perhaps one of the greatest inland heronries in North America. In it nest more than three thousand pairs of birds of five species—the American egret, Ward's heron, black-crowned night heron, double-crested cormorant and anhinga. The nests, with few exceptions, are built in cypress trees between seventy and one hundred and thirty feet above the shallow water below. I planned especially to concentrate on the home life of the American egret.

My first task, then, was to erect a blind in one of those great trees from which I might observe and photograph the birds around me. It required two days of grueling work before a tiny shelter about four feet square was completed, one hundred feet up in a staunch cypress tree. My greatest handicap was not the packing of materials through two miles of underbrush and swamp, or climbing the tree, but battling the prolific insect life. Mosquitoes, deerflies and chiggers fed on me. I scratched so much that my hide looked as though it were dotted with Indian mounds.

When completed, the tiny shelter proved worthy of the effort. Always before me, no matter where I turned, were hundreds of birds' nests. Nearly all were occupied. The lovely white of the egrets looked like great splotches of snow caught in the lacy green fringe of the cypress trees. Double-crested cormorants in all stages of growth were silhouetted against a sky whose face was always changing from one breath-taking cloud formation to another. Stately Ward's herons, posing gracefully on dead branches, gave the scene a touch as of the Far East. The long-necked anhingas added a breath of the Tropics. As I glanced downward the sunlight filtering through the cypress boughs made the whole swamp cathedral-like.

Beauty, however, was not the only thing one could see. The activity of the heronry would put a modern city to shame. Activity is hardly the word to use in describing the affairs of Cranetown. It is a show all in itself, done on a grander and vaster scale than any three-ring circus ever organized. Not even a camera equipped with a wide angle lens could record the happenings of those birds as they lived their lives in this concentrated group.

The first morning I entered the blind I witnessed a most exciting event. As usual, my tree-climbing was greeted by discordant squawks from a thousand bird throats. I disappeared in the blind and the turmoil quieted to half its volume—Cranetown's nearest approach to



LEAST TERNS WERE SEEN FEEDING ON THE LAKE AND RESTING IN PAIRS ON MANY OF THE STUMPS THAT STUD ITS SURFACE. THEY NEST ON RIVER SANDBARS

silence. As I rested from my one-hundred-foot climb, my cameras still unpacked, I was startled by a commotion at my back. I peeked through a slit in the blind and saw a raccoon fleeing sure-footedly along a cypress branch in a neighboring tree. He was leaving an egret nest he had just pilfered. After him stormed at least eight egrets and encouragement to the pursuers came from a hundred bird throats. As I fumbled through my pack for my cameras the intruder made good his escape by slipping into another tree. Thus I lost an unusual action picture.

Most of the birds nesting in the colony had completed hatching their eggs. The young in these nests were in varying stages of growth. I noted some young egrets no bigger than a grackle. On the other hand, some of the young Ward's herons and egrets were already flying about the heronry, returning to the nest to be fed. In a dead cypress thirty-five feet away were two empty nests. I assumed that the young had departed, but a half hour later I saw three young birds standing in the upper of the two nests. I watched them for perhaps five minutes while they preened themselves. Then an adult bird drifted in and alighted gracefully a few feet from the nest. Bedlam broke loose from the trio. They clamored and reached far over toward the adult bird. The parent studied my blind for a moment and hopped into the nest with the young. The babies, standing fully four feet high, all reached for their parent's bill. "Speared" would be better than "reached" for there was nothing gentle or refined in their method of grasping to be the first to be fed. One of the babies managed to get a top scissors hold on the old bird's bill and the other two stopped at once their efforts to get a similar hold. Baby then vigorously shook the old bird's eight-inch-long bill and yard-long neck until a large lump began to rise from somewhere in the breast. The parent's head and neck were now bent sharply down from the baby's pulling, and gradually that lump slid forward and plopped into the nest. Usually the food was transferred directly from the parent's bill to that of the young. In this case, however, the food, a fourteen-inch grindle or bowfin, was too big to handle in this way.

No sooner had the fish touched the nesting platform when three great knife-like bills all shot downward to pick up the finny delicacy. One caught it by the head and started to swallow. Another baby plucked it from the first bird's bill by the tail, only to lose it to the third one who took the fish by the head. So the fish was passed around three times, until finally one was a little slow on the recovery. The lucky youngster that had the fish by the head at that instant swallowed it whole with four mighty gulps. As soon as the fish was swallowed the parent bird took wing. The young climbed out to the tips of the dead branches and after a few moments of preening all departed, each in a different direction. Two hours later they were back again waiting to be fed.

An egret family of five young and two adults, just twelve feet from my blind, claimed most of my attention. The young birds were like the young Ward's herons in that they left their nest after each feeding. They were still too young to fly, but they could all climb agilely on the slim branches. They usually awaited mother's or father's return, perched somewhere out on the tip of their nest branch. The moment a parent put in its appearance they all scurried back to the nest as though instinct taught them to associate the nest with food. Mother did most of the feeding. After alighting on the nesting branch she always paused and looked about to see that all was well. Usually she rested for a few moments, preening herself, paying careful attention to the plumes, which she smoothed out like tresses with her long bill. Such hesitation was an unkind act in the eyes of the five babies. They wanted food—not a glimpse of a beauty parlor. They trembled from head to foot in anticipation. Their downy heads were drawn close to their bodies and nodded back and forth. Accompanying this motion was a clicking sound unlike any other bird sound I have ever heard. Mother, finally satisfied that all was well, and with her bridal veil of plumes neatly groomed, would tread gracefully toward the nest. The moment she came within reach,

WILD RICE FIELDS WERE SCATTERED ALONG THE SHORE AND THERE LEAST BITTERNS WERE NESTING

the babies' necks, which had looked so short a moment before, would shoot out with their yellow bills. Here again, the young would take a top scissors grip on mother's beak and shake until food was forthcoming. The battles that raged among those five were as comic as they were serious. One youngster I nicknamed "Nasty Philbert." He was the terror of the nest and generally managed to get firsts at every meal. He could get into and cause more trouble than the four other babies put together. Frequently mother could disgorge only enough partly-digested fish or frogs to feed three or four of her youngsters, and the hurt look the unfed ones showed when their mother departed was most amusing.

A most interesting thing we noted was the fact that mother never closed her eyes during the process of feeding the young. At first this seemed a rather dangerous practice since the babies frequently missed mother's bill in an attempt to catch hold to get fed, and their own bills would glance off various parts of her neck and head. When the babies did grasp mother's bill it was usually just above the base and almost to the eye, yet the yellow orb remained wide open. We thought that mother stood a good chance of losing an eye from a mis-directed baby's bill, or of being sliced open by a bill's edge when a baby grabbed hold. Our fears were dispelled when we examined the bill of a young bird—one of about a hundred that fell to their death during a great storm. The beak was soft and fleshy, rather than hard and flinty like those of the adults. Had a parent's eye been struck the soft bill apparently would have done little damage.

This egret family was not the only household to claim attention. A goodly number of double-crested cormorants nested near our blind. A little community of about twelve nests were closely packed along a dead branch forty feet away. We called this group "Cormorant Ridge" because of its exclusiveness. Each time a parent bird came with food it sounded like feeding time at the sea lion cages in a zoo. The parents and young would bark, belch and growl at each other fiercely. Baby cormorants differed from the herons in the process of feeding. They reached well down inside the parent's throat for their food and it was somewhat weird to follow the progress of baby's bill as it worked inside mother's throat, because we could see the taut skin when the bill, inside, pressed against it.

From our blind we always saw or heard numerous other kinds of birds that nested away from the heronry. Prothonotary warblers were there in number, and their song could usually be heard above the din of Cranetown, as could that of the parula warbler. Black vultures sailed ceaselessly over the heronry searching for offal and dead birds; wood ducks and pileated woodpeckers passed before us frequently.

The lake waters teem with life that made good feeding, not only for the herons, but also for countless birds that nested in the great wild rice fields scattered along the

lake shore. We found purple gallinules, least bitterns and coots nesting in these spots. Each time we neared open water we heard the yipping of least terns and always saw them in pairs resting gently on snags. They nest on the great sand bars along the Mississippi.

The wild rice beds and fields of cow-lilies are alive with frogs of many species. Almost every exposed log has its sunning turtle. The number of these shelled animals that meet their death on the highways nearby is appalling, yet it is sound evidence of their abundance. At least six different species of water snakes, and almost twice that many land snakes, find a good home at Reelfoot Lake. Raccoons, minks, muskrats and a host of other small mammals have also found the lake an ideal home.

The lake itself is a natural fish hatchery. Some fifty thousand pounds of fish are taken out of this body of water each month by commercial fishermen and yet the supply does not diminish. Indeed the Conservation Department of Tennessee uses the lake as a source of supply.

Truly, after my experience at Reelfoot Lake, I say earthquakes are fine builders of potential wildlife sanctuaries.

Insects with Ideas

Instinct does not explain all of the amazing acts of the insect world

By S. F. AARON

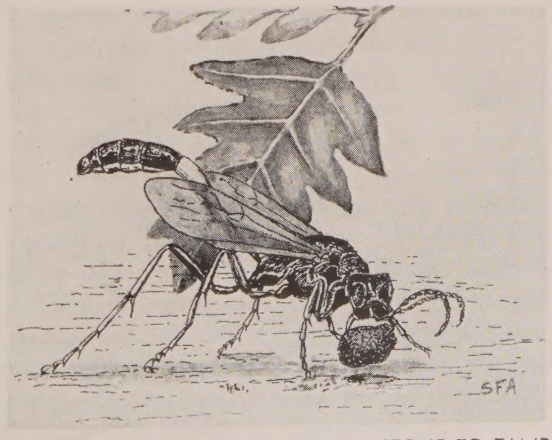
Illustrated by the Author

THE ROBBER FLY PATIENTLY WAITS UNTIL ITS VICTIM, THE BEE ON THE BLOSSOM BELOW, TURNS AROUND AND MAY BE ATTACKED FROM THE REAR

WHETHER what we choose to call the "lower forms of life" possess intelligence is a subject of frequent and often spirited debate. Man is commonly held to be the only form basing acts upon understanding, profiting by memory and acting upon his own designs. All other forms of life are said to act on instinct. They are credited with an impulse handed down to them that makes them do things without taking a page from their experience or making any plans.

Probably there can be no end to debate about this subject, any more than there can be to discussions of religion. Yet it is interesting to observe all sorts of activities in Nature, to note some acts that seem to have all the earmarks of intelligence, and to form one's own ideas. We will find, of course, that some are more ready to credit intelligence to mammals and birds than to other forms. But when we come to insects, which receive their impressions through a spinal cord instead of a brain, the custom is to describe their actions as instinctive and let it go at that.

Careful observation, however, will give us food for thought. Keenest among the insects are the Hymenoptera, the order that includes the bees, wasps, ants and certain other related groups. Of these, the ant is a favorite subject. Perhaps the social habits of ants result from instinct. But isn't there something more than that in the raids they conduct, the wars they wage, the robberies they commit? Is it instinct only that makes them drive off certain trespassers and accept others, or is it intelligence? What leads them to discover hidden treasures, or to carry home the prizes of war or discovery?



A DIGGER WASP USING A SMALL STONE TO TAMP DOWN THE EARTHEN FILLING OF ITS BURROW

The wars waged by the big red burrowing and the black carpenter ants have become almost proverbial, the former rarely passing up an opportunity to raid the latter, coveting their pupae for the purpose of rearing them as slaves, or to feed their soft bodies to the baby reds. But twice I have seen a small colony of reds close to a large colony of blacks, their usual victims, going four and seven times the same distance to make war upon *smaller* colonies of blacks. Did these reds deliberately estimate the numbers of their feudal foes?

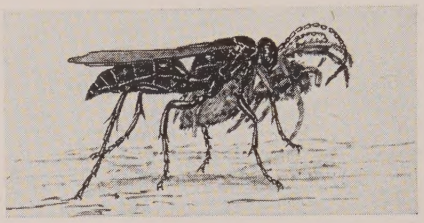
I have seen a big red ant, aided by some of its fellows, robbing a line of blacks that were carrying dead flies from an emptied trap to their nest. The red pirate met squarely a big black but ran to one side, letting its foe go by. Immediately thereafter it met and robbed a smaller black worker of the same kind of loot. Was this thoughtless impulse or clear and mighty good judgment?

An ant may practice foolish stunts in carrying away a prize, by uselessly climbing weeds, stumps, posts and rocks in the way, instead of going around them, guided as it is to its kill by scent alone. Yet the observer cannot long watch the proceedings without witnessing many acts in overcoming obstacles that call for nothing short of reason. Lifting a dead fly up a vertical wall an inch high to lodge it on a protruding point, then going, uphampered, up the rock to one side, reaching down and pulling up the burden over the edge, was an act I have long hesitated to make known, believing that it would not be credited. Perhaps it was a coincidence; ants often leave

their prizes, even when alive, to scout their chosen path. Sometimes they may return to the burden by another route, influenced by scent.

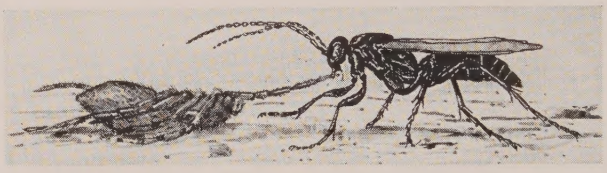
It is worthy of consideration that the powerfully sensitive scent faculties of insects account for many of their remarkable actions that may be mistaken for reasoning. For instance, it is scent alone that enables them to find their way to desirable food—from plant louse honey dew to the picnic cloth—and then to go home again, quite unerringly, except when interrupted by cross scents or other delectable odors. Reason, of course, does not enter into this at all.

On the other hand, many acts of the solitary wasps and their relatives in finding their prey, making captures, bringing the victims home, meeting obstacles in so doing, digging their burrows, or building their mud nests, cannot be accounted for as due alone to some inherited urge. Of course, nearly every impulse they possess and act upon is instinctive, but there seem to be exceptions.



TWO DIFFERENT METHODS. ONE DIGGER WASP DRAGS AND THE OTHER CARRIES A SPIDER VICTIM TO ITS BURROW

I have met one wasp that departed from the usual method of carrying its prey to its burrow. Instead of laboriously dragging its spider for many minutes at a time and over yards of ground in one direction, this erratic creature pulled it for a few inches, then left it to fly back to the burrow as though to assure herself that the hole was still there and ready. Was not this based upon a fear of interference? Others of her species take it for granted that the burrow will be ready to receive the food for the young; still others make the capture and dig the burrow afterward.



Such varied actions certainly suggest that instinct does not play an exacting part, and that experience may be a factor. Phil and Nellie Rau, in their delightful *Wasp Studies Afield,* cite numerous cases of digger wasps that have departed from inherent habits. A wasp that commonly seeks its own prey may occasionally rob another of its own species. Others that sometimes use discarded or last year's incompleted cells of the mud mason wasp more often make their own nests from a supposedly unerring instinct. One species drags the earth out of the burrow with the forelegs when the usual method with the species is to kick it out from beneath the digger's body. A wasp had a heavy caterpillar in a depression and to get it out she deliberately lifted first one end and then another "exactly as a man, working alone, would hoist a heavy timber little by little." The most intelligent act that these careful observers record is of a wasp that, when threatened, barely sealed up her larval stores below and then made a plug at the surface, believing the time too short to complete the filling as it should be done.

Often it is desirable to arrange unusual conditions for tests of mental action, rather than wait for chance to provide them. So I placed a small weed stem across the burrow mouth of a big golden digger when she was away. She returned with a grasshopper and shoved the stem aside. I replaced it before she came out and she just got by it. In half an hour, when she again appeared but without a victim, I had the weed stem to interfere again. So she seized the stem in her jaws and removed it about three or four inches from the burrow. Entering, she was below about half a minute and once more found the stem in the way. After a tedious wait, she returned without a victim, to find the stem rather firmly fixed in the earth over the hole. This quite settled the matter. She violently seized one end of the light, stout bar and dragged it away to a distance of fully two feet.

Here was a matter of selected distance with the evident idea that the weed stem would not be apt to return, from wind or other mysterious cause. Inherited impulse would hardly sum up to such a conclusion.

With the black *Pompilus* wasp there is a strong inclination to disguise the position of its burrow after it is completed and filled. Before this task was finished I drove one away and scattered some inch-long weed stems thickly and close to the hole. Presently back she came, at first finding it difficult to locate her burrow, then seeming to remember that her work was not completed. Taking these pieces one at a time, she carried and piled them loosely about ten inches away and returned to go about her usual acts of disguise. About the burrow of another wasp of this species I placed a dozen such pieces, but when the owner found her burrow she was content to let this disguise remain.

Observe *Thalessa,* possessor of the most "wonderful drill in the world," sending its hair-like ovipositor two inches or more into solid wood to strike unerringly the boring of a sawfly larva not over a fourth of an inch in diameter. Remarkable, indeed, is the boring by such a tool, but even more wonderful is the precise aim and direction maintained to gain its purpose: the deposition of a parasite egg.

Now, the laying of the egg and the manner of placing it follow a natural impulse, but what may be the mental process that controls the aim? Can such exact judgment made at the other end of the creature from that which merely tells the presence of the victim by odor be a mere impulse? Is not choice a major factor added to volition, and will not a knowledge of the difficult conditions necessarily be employed?

The spiders are second to none among the arthropods in the matter of brains, or whatever develops their thinking processes. They are as highly organized physically as the true insects, though minus wings. As with the ants, bees and wasps, they exhibit certain mental traits rather

superior to all other creatures, two-, four- or six-legged, feathered, furred, scaled, shelled or encased.

When spiders spin their webs, as most of them do in some form or other, they practice arts inspired by the need to survive. Yet there are, in the processes of web building, too many variable and often rapidly changing conditions to be cared for by mere instinct alone.

Inherited impulse compels the spinning of the silken strands out of secreted material that is crowding the spider body; the engineering outline is a matter of inherited direction, like the figure eight of the silkworm cocoon; the substitution of viscid strands to which victims adhere for those used merely as first braces, and the placing of these final transverse spirals at distances between which small flies cannot pass, may all be done without previous experience and practice. But when it comes to placing the first supporting cables may not trial and error play their part toward wise construction?

Madame Spider must first lay well her foundation and these cables must adhere and must be tested for strength or the stability of a leaf or twig to which they are attached. The too great spring-back with the wind of a branchlet, breaking or loosening the cable, may occur and the structure is in danger. These accidents do happen and to offset them has not the principle of survival developed a form of wise choice based on reason? It would seem quite unreasoning to assume that such a fine process of engineering was the work of an unthinking automaton.

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THE GERENUK

By N. TOURNEUR

Illustration by R. Bruce Horsfall

ONE OF NATURE'S STRANGER ANIMALS

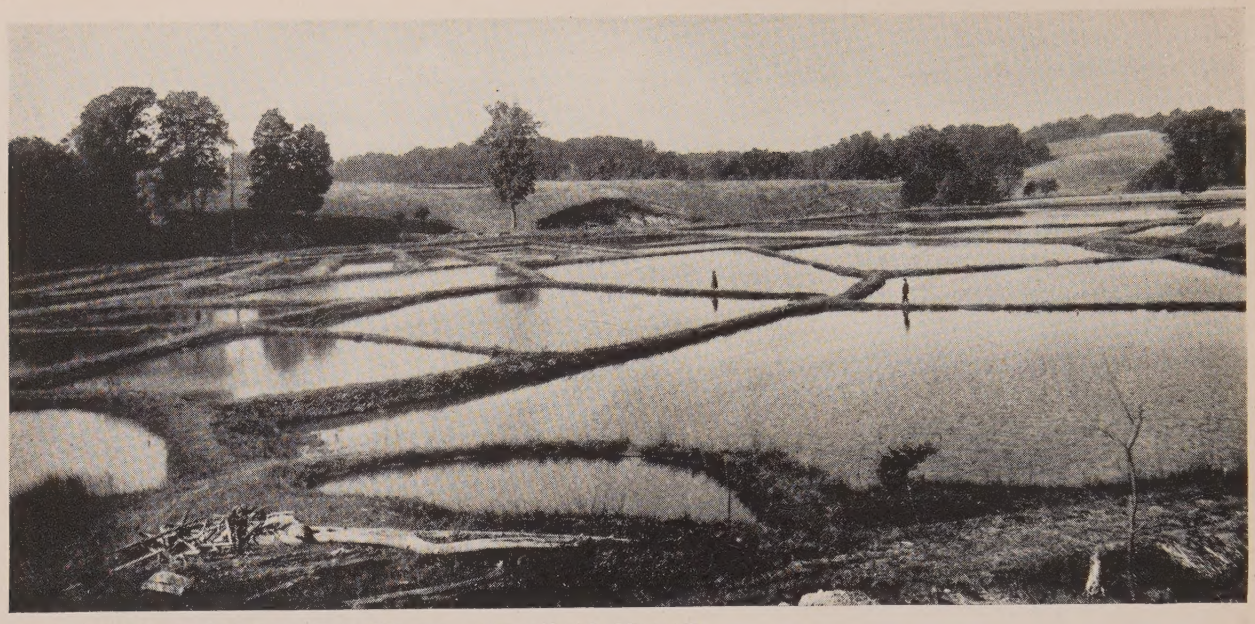
The gerenuk, which at first glance may seem to have some of the features of a giraffe, is really an antelope. It lives in the drier areas of British East Africa and Somaliland

WHOEVER heard of a gerenuk! Whoever saw, even in the zoo, the animal pictured here, which is a bit ludicrous, with its half-antelope and half-giraffe appearance! But if you happened to live or to have traveled in Somaliland or British East Africa, this peculiar creature would be a common sight to you. He is an antelope and his scientific name is *Litocranius walleri*. He is called "little camel" by some of the natives because he trots and lies down in much the same manner as a camel. Then there are other similar attributes. He can go for long periods without drinking, and prickly shrubs are luscious morsels to him.

Although this queer animal stands only four or five feet high, he can reach to a height of seven or eight feet when on his hind legs. Nature has given him a peculiarly-shaped upper lip covered with rough skin that, with his tongue, enables him to grasp easily a bit of forage high overhead. Although somewhat resembling the gazelles, he differs from the members of this graceful family in his clumsy movements. However, he has traits to his credit not shared with his better-favored cousins. He is indifferent to the heat, and would as soon lunch in the torrid sun of midday as to breakfast in the dew-cooled morning.

His appearance is like no other living animal; not only is his grotesque figure unique, but so is his coloring. Perhaps he believes that covering his odd figure with a coat of many colors redeems him. Anyway, he is a vari-colored beast, with a back of a reddish brown and sides of a lighter, almost buff pink. Underneath he is white, the buff pink appearing again on his long slender legs. His knees are set off neatly in black. His face is generously splotched and streaked with white, and just below the horns appears a vivid white streak. Altogether he looks as though he might have been "done over" by an interior decorator with futuristic tendencies.

He is as wild and wary as the zebra, travels alone or in small bands, and, requiring little moisture, is able to live in the driest parts of the country. If surprised, he sneaks off at a slow ambling trot with head and neck stretched out straight before him, constantly sniffing the wind, but he makes his getaway with the same swiftness and speed that characterize the more graceful of his relatives.



PONDS WHERE GOLDFISH ARE RAISED TO MEET WORLD DEMAND
The ponds are constructed at different levels to assure movement of water and to permit draining when it is time to gather the mature fishes for shipment

GOLDFISH—ASIATIC IMMIGRANT

Demand for the brilliant fishes creates an industry

By GEORGE RANDALL McCORMACK

WHERE do they come from—the millions of goldfish on display in the aquariums of every pet shop and ten-cent store in the Nation? Perhaps you, too, thought they were imported from some remote corner of the world? We admit we did. Then we visited the busy little city of Martinsville in southern Indiana, and there our curiosity was satisfied. There we found the source of a large percentage of the goldfish in America, and along with it we found a most fascinating enterprise.

It is a million dollar industry—this raising of goldfish. There are some five hundred hatcheries in the United States that produce annually more than fifty million goldfish that are sold, at prices ranging from ten cents to two hundred and fifty dollars each, to fanciers in every country. The hobby of keeping goldfish and tropical fish is widespread, and certainly there is none with a more scientifically conducted business catering to it.

The popularity of goldfish and tropicals is due, no doubt, to the attraction of graceful form and brilliant color in motion; as well as to the special demands of maintaining an aquarium. Almost every locality has its fanciers' club, and there are national and international exhibitions where gorgeous fish of varied shapes and colors are on display.

The story of the development of goldfish goes back many centuries to the time when the patient Chinese began to experiment with certain species of native carp. Through selection and controlled breeding they produced many of the grotesque and bizarre forms so well known today. Goldfish belong to the carp family, Cyprinidae. In its natural state, the body of the fish is moderately elongated and compressed, and is covered with large, coarse scales. The fins are relatively small, and the general coloring is olivaceous. It seldom exceeds twelve inches in length. By selection and cultivation, however, the appearance of the fish has been so changed that one authority states: "Goldfish are the most profoundly modified of any known race of domesticated animal organisms."

Early in the Eighteenth Century the Japanese began to work with goldfish and added much to the beauty of form and coloring of the fish. They were not introduced into the United States until 1878, when Rear Admiral Daniel Ammen presented the Commissioner of Fisheries with a number of specimens from China. From this stock great numbers of goldfish were produced at the government hatcheries, and, by 1890, commercial hatcheries in Maryland were putting them on the market. Goldfish soon became so popular that one enterprising manufacturer hit upon the scheme of redeeming his profit-sharing coupons with a bowl of goldfish. His business taxed production facilities until, suddenly, he found he could no longer obtain goldfish in sufficient quantities. In desperation, he told his troubles to E. C. Shireman of Martinsville, and Shireman, who had recently acquired six hundred acres of marshy land, offered to help him. With two hundred goldfish and one small pond, he set about to supply the thousands of fish required to meet the demands of his friend's sales scheme.

At that time, Mr. Shireman knew little about scientific fish culture and, as a result, only five per cent of the first

crop was usable, chiefly because of improper coloring. The application of scientific methods gradually solved production problems and today the Martinsville hatchery, in its 1500 acres, has 645 breeding and rearing ponds. Annual production approximates 10,000,000 fishes and shipments are made to Canada, South America, West Indies, Hawaii, and to all European countries.

Each step in the production of goldfish calls for scientific skill. There are innumerable technical problems to be met, including feeding, water temperature, selection of stock, combating animal parasites and bacteria, harvesting and transportation. To aid in the solution of these problems a modern hatchery maintains a chemist and a biologist, and scientists from the universities and private laboratories visit the plant from time to time for research and experimentation.

BRINGING IN THE FISH

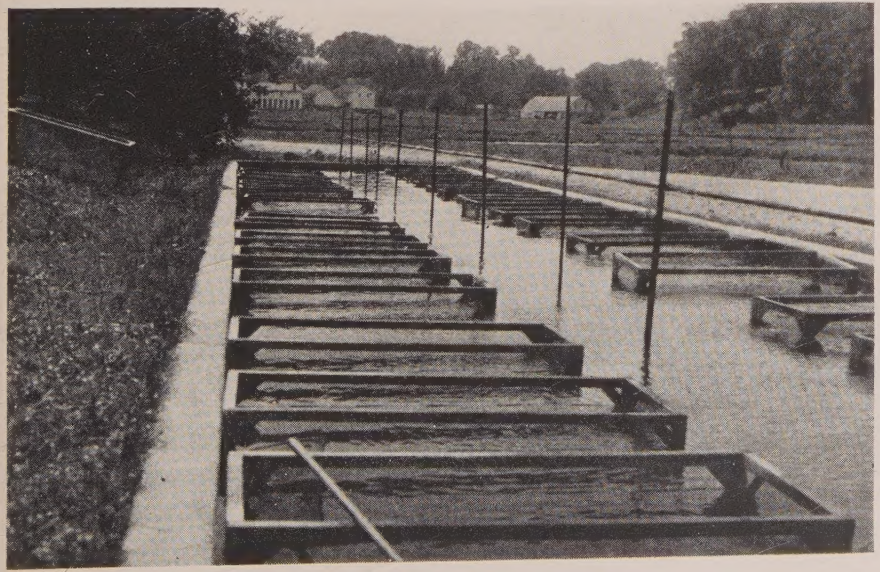
Marshy land precludes use of trucks and the fish are gathered in buckets. The neck-yoke eases the strain

Authorities state that there is no foundation in fact for the widely-circulated story that goldfish can be produced successfully only along a certain parallel. They say that these fishes can be raised successfully almost anywhere within the temperate zone. Local conditions, such as temperature and water composition, may cause variations in the color of the fish. Goldfish often escape into streams near the hatcheries and live there as well as do the native species. Hundreds of persons are attracted to Fall Creek bridge in Indianapolis by the countless numbers of goldfish there during spawning season.

At Martinsville the spawning season begins early in April and continues through September. At the start of the season the breeding stock is placed in specially-constructed pools, which have been thoroughly sterilized. To make certain that the fishes will lay their eggs in the nests—boxes in which strands of Spanish moss are attached to screen wire—all vegetation is carefully removed from the edges of the ponds. As the female deposits the eggs in the nest boxes they are fertilized by the male, after which they become firmly attached to the strands of the plant. Goldfish are prolific, and a healthy female often produces in a single season as many as 75,000 eggs, spherical in shape and about two millimeters in diameter. After the eggs have been fertilized, the nests are placed in concrete hatching tanks. There they remain for ten days or two weeks, depending upon water temperature, before the fry emerge from the eggs.

Despite their small size, the microscopic, semi-transparent fry are big eaters and, during the first few days of their existence, consume unbelievable quantities of dried egg yolk. They actually eat the equivalent of their own weight daily, and last year the Martinsville hatchery imported from China more than twenty-five tons of dried egg yolk to satisfy the enormous appetites of these tiny fishes during the first ten days after their emergence from the eggs. Nature has provided the minute fry with protection in the form of coloring that camouflages them. However a simple device enables one to see them readily. A highly polished piece of chromium plate attached to a rod is lowered into the water and, as the fishes swim over it, their images are reflected to the eye.

After ten days in the hatching tanks, the fry are removed to rearing ponds, and the diet is changed from egg yolk to coarse wheat flour. Later, the fish will receive corn meal and ground oats, and live food in the form of water fleas (*Daphnia*). At the Martinsville hatchery ten to twelve tons of ground grain are fed daily. Formerly the grain was cooked in



THE "HARDENING" BOXES

The goldfish must be trained for shipment by gradually lowering the water temperature

steam cookers, with a combined capacity of three tons. At present cooking is confined largely to the winter months, as it was found that the fish grew more rapidly and uniformly when fed dry grain.

Despite the fact that there are more than 425 acres of water surface at the Martinsville hatchery, the place is remarkably free from mosquitoes. "The idea that goldfish ponds are responsible for an increase in mosquitoes is erroneous," said Superintendent Byram. "Mosquito larvae are natural food for goldfish, and a short time ago we shipped a large consignment of fish to a veneer mill where they were used to clean out the larvae from the soaking vats."

Goldfish grow rapidly and, by the time they are six months old, are ready for market. When time comes to remove the fish from the ponds the water is drained away. This is easily accomplished at Martinsville, since the ponds are built in stairstep order and any pond can be drained into the one below it. Since the ponds are spring-fed, loss of water is not a serious problem. Draining the ponds is more satisfactory than seining, since the fishes fight the net and sometimes are injured and die. Furthermore, the ponds must be drained and sterilized before another crop is placed in them. Sterilization is done with poisons that kill all weeds, bacteria and animal life.

Since there is wide variation in the size and coloring of goldfish of the same age, it is necessary to sort and grade them. This is done by experts who work on tables covered with white oilcloth. With speed and uncanny accuracy the fish are separated and put into proper containers. Sports are segregated and reserved for breeding purposes. Despite the fact that some goldfish are deficient in coloring pigment, no true albino has as yet been found. Likewise, all goldfish have scales. However, some of them have scales so thin and transparent that the erroneous term "scalesless" has come into use. The off-color fishes are sold as bait, and game-fish hatcheries also buy them to feed to breeding stock. According to Superintendent Byram, goldfish have been known to live twenty years at the Martinsville hatchery and to attain a length of twenty-four inches. Such a fish weighs about three pounds.

From the moment the goldfish fry emerges from the egg it faces a struggle for existence against a host of enemies. The major problem confronting the producer is that of combating bacteria, insect parasites, and various animals that prey upon the stock. The water snake is the worst pest of all. They are numerous, and feed constantly. Turtles, frogs, and crayfish are good fishers and consume many goldfish. Then there are the ducks, geese, cranes, herons, gulls, loons, bitterns, coots, owls and kingfishers, which must be kept away from the ponds.

As troublesome as are birds and the parasites, they present no such problem as do certain of the bacteria and insect pests. Bacteria are ever-present in the water and await only a slight injury, such as the loss of a scale, to begin their deadly work. Then there are such enemies as the water hydra, the giant beetles, the water tiger, the leeches, and, worst of all, the larvae of the dragon fly. These pests can be combated successfully only through use of deadly poisons, applied after draining the pools.

Transportation of goldfish was formerly a major problem. This has been solved by the construction of an insulated tank truck, equipped with an aerating system and heating plant designed to maintain proper temperature and oxygenation at all times. Goldfish can stand a wide range of temperature, but sudden changes are almost always fatal. They have been known to survive after being frozen solidly in ice, and many are left in the outdoor pools all winter.

Local and small consignments of fish are shipped in heavy metal cans that have a capacity of 750 average-sized fishes. These cans have countersunk, perforated caps that serve as compartments for ice. The melting ice supplies fresh water and oxygen to the cans and keeps temperature nearly constant. The stock remains in good condition in these cans for 72 hours without attention. Fishes for England are shipped in specially-constructed tanks aboard the Queen Mary. From England they go to every European country.

Goldfish culture is one enterprise of Oriental origin at which American producers have outstripped the Chinese and Japanese. Transportation and production methods in the United States enable American producers to offer prices that largely eliminate foreign competition.

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HAWAIIAN GOOSE FOUND IN THE WILD

THOUGHT to exist only in captivity, the nene, land-loving Hawaiian goose, has been found in the wild state on the forested slopes of Mauna Loa on the Island of Hawaii. Harold Craddock and Walter Donaghho, student technicians in the Hawaii National Park CCC Camp, found a flock of eight birds at a 6500-foot elevation near a truck trail.

The birds were not frightened and the boys were able to obtain pictures. Later study in company with Park Naturalist Lamb disclosed roosting sites, droppings and feathers. Additional study may produce valuable data concerning the habits of this goose that shuns water and lives the life of an upland game bird high up the slopes of Hawaii's famous volcano.

DUNES, THE OFFSPRING OF SOIL DESTRUCTION, IN SOCORRO COUNTY, NEW MEXICO

Moving with the winds, these dunes are difficult to check, and, as they shift, they cover more and more land and make more and more desert

Wasting or Saving Our Soil

Our annual loss from soil destruction is $400,000,000

By HENRY H. COLLINS, JR.

This is one of a group of articles by Mr. Collins, special assistant to the Chief of the Soil Conservation Service. Having drawn a graphic picture of what has happened and what is happening, Mr. Collins will, in subsequent articles, discuss the meaning of soil devastation in its most vital aspects.

LOVERS of Nature have but lately become conservationists. Prior to the eighteenth century, it is to be feared, most Nature enthusiasts were those who loved to hunt elk, fox or roebuck, wild turkey or heath hen. As game diminished and species disappeared, the lover of Nature had to become a conservationist or there would have been little left for him to love. Interest in conservation, therefore, arose first in those departments of natural science where species were being most rapidly exterminated. The extinction of the passenger pigeon helped awaken lovers of wild life to the need for bird protection. The slaughter of the bison, the big-horn and the grizzly aroused hunters to the need for conserving game, and naturalists to the need for conserving all wild species.

The felling of the great forests of the East and North and the increasing devastation of our western timberlands made forest conservation a part of our national program. The encroachments of civilization, with its destruction of natural habitats, caused such a vanishing of our native flora that even wild flower societies sprang up to safeguard for our children the native plants of our woods and prairies. Until recently, however, little thought has been given, or attention paid, to the disappearance of our greatest asset of all, the soil, upon which our wild birds and mammals, our trees and our flowers, and above all, mankind and his posterity are primarily dependent.

Through the long avenues of geologic time, wind and water, sun and snow fashioned the American mainland to those forms that greeted our forefathers when they first saw and settled this country. Through countless ages these forces wore down the Appalachian Mountains to their present gentle slopes, and covered their foothills and lowlands with deposits brought down from above. The Great Plains received the outwash from the Rocky Mountains; the Great Basin that from the surrounding ranges. The ridges of southern California

FARM TURNED INTO DESERT NEAR WOLSEY, SOUTH DAKOTA

In the spring of 1936 this farmland had been blown down to the point that the subsoil was exposed with rocks scattered on the surface. This is a result of wind erosion

might be higher still had they not given birth to those vast accumulations of weathered rock that filled, during the Pliocene epoch alone, the Ventura Basin with sediment hundreds of feet deep. From the Coastal Plain to the Coastal Ranges the agents of the atmosphere have softened the rugged outlines of the landscape with the brown and gentle blanket of the soil. Imperceptibly the soil grew thicker and more fertile until, over the whole continent, it supported those vast and lofty forests and those dense and fertile grasslands that made America the wealthiest natural domain on earth.

Now all has changed. With the white man came those triple foes of Nature, the plow and the cow and the axe, and the original aspect of the country was irreparably altered. As the land was cleared, the soil, unnoticed, commenced to disappear. Today, from the Aroostook potato fields of northern Maine to the avocado orchards of southern California, and from the beaches of Oregon to the Gulf Coast, the soil is being swept from the land. Those same agents that once sculptured the smooth curves of the rolling East and softened the rugged outlines of the Rockies are now, with the assistance of mankind, destroying in a few generations the soil wealth that it took them geologic epochs to create. Wind and water, snow and fire are the agents—and accelerated erosion is their method, manifesting itself in many forms. Sheet erosion and gullies, dunes on the beach and dunes on the prairie, avalanches in the mountains and fires in the swamps reveal to the observant the portents of the future; and, if unchecked, these phenomena will in time render America as desolate as those vast deserts that today blanket in moving sand the once flourishing civilizations of the East, the remains of which now decorate or haunt the confines of the Kara-Kum, the Sahara and the Gobi.

Receiving little attention until recently, *sheet erosion* is, in its total effect, perhaps the most destructive of all. From coast to coast, and from the Gulf to Canada, wherever even the most gentle sloping land has been cleared, sheet erosion may be looked for and found. As water flows downhill it carries off from cultivated fields and overgrazed slopes little particles of earth, the richest constituents of the soil. The original twelve or twenty-four inches of productive top soil are gradually and insensibly swept away. The light-colored patches of earth in bare fields, the "bald" spots where grass won't grow on pastures, many of the abandoned fields and abandoned farms that one sees in any drive through the country, are examples of the effects of sheet erosion. In time the layer of top soil shrinks from a foot or two to an inch or two in thickness. Then it disappears—and so does the farmer.

Gully erosion, easily observable, is undoubtedly the most striking general indication of land decay. Twenty million gullies, it is estimated, combing the eastern slopes of the Appalachians, have riddled the Atlantic Piedmont with their long streaks of infection. Wherever rainwater runoff from fields or roadsides is concentrated, there a gully is likely to form. Once started, if unchecked, it grows wider and deeper and longer with each successive rainfall. Working uphill, it eats back into the fields whence it originated; while downhill it spreads its burden over the acres below, usually as infertile debris, the former top soil now inextricably mixed with subsoil and gravel from the fields it has been despoiling above. The Southern Railway from Washington to New Orleans follows the foothills of the Appalachian Mountains through the Piedmont regions of South Carolina and Georgia. From the

THE SCENE ON THE OPPOSITE PAGE CHANGES

Here we see the same farmland in early August, 1937. Cane and sudan grass were sown as emergency cover crops to hold the remaining soil and start the process of restoration

train window, for mile after mile, one sees enormous gullies cutting downward to the east. They have long since ruined the land for agriculture and many are still increasing their encroachments into the second growth woodlands that now hang precariously over their gaping margins. Highways are periodically rendered impassable with silt from above. Railway bridges are regularly threatened. Reservoirs made on many streams have been successively silted up and abandoned as the sediments have poured down unchecked from these bleeding wounds in the land.

The counterpart of the gully in the East is the arroyo of the West. There, overgrazing has loosed on the drier lands the same destructive forces that unwise cultivation has set in motion in the humid east. From the High Plains to the High Sierras, and from the Mexican border to the Canadian line, the fifteen great western states of America, without cessation and almost without exception, have been overgrazed by cattle, sheep and goats for the past sixty years. The arid and semi-arid country of the West hangs more precariously in Nature's balance than do the regions of heavier rainfall in the East and South. Vegetation once removed is slower to return where precipitation is scanty. Hard summer rains, no longer absorbed over a large area by former grass stands, flow rapidly over the sun-baked soil to concentrate in the once insignificant streambeds. These now become greatly enlarged, deepened and broadened. Perennial streams of clear water disappear and their beds change into arroyos, where, after each heavy rain, floods fill them for a few hours with a turbid flow. Otherwise these channels are but dry washes.

The San Simon Valley in Arizona, until the eighties a great grassy basin almost the size of the State of Delaware, has been changed into one of the most desolate regions in the Southwest. Intensive overgrazing; an artificial ditch as its mouth; a severe drought in the nineties and a great flood in 1905 have completely altered the aspect of this ancient pasture. Where antelope and deer once fed on the rich grass meadows made lush by summer rains, a steer wandering today over much of this denuded land would find 1200 acres insufficient to support him through the four seasons. The mile-and-a-half ditch has grown to a length of one hundred miles. Its channel has deepened from four feet to twenty and its breadth has widened from twenty feet to three hundred. For a width of half a mile the center of the valley has been irrevocably ruined by gullies, and arroyo erosion is still adding at the rate of 1000 acres a year to the damage, which as long ago as 1920 had been estimated at more than $15,000,000. Fifteen thousand cattle now eke out a starveling livelihood on a range which, even after the great drought, still supported 50,000 head in 1895; and silt, unknown of old, now washes down in tremendous volume with the flash floods of summer to pile up behind Coolidge Dam and threaten with a premature end the life of the San Carlos Reservoir.

Barranca is the name applied to the imposing gullies of southern California. The soil there is particularly erodible and is of such a nature that gully sides take the form of perpendicular cliffs. Its fertility, however, is great and has induced the cultivation of steep slopes even though, due to erosion losses, high productivity can be expected only for a few years. In one valley near Santa Paula a farmer fifty years ago plowed along one edge of his field a shallow trench to drain off excess rainwater. This ditch, like that of the San Simon, worked only too well.

A DRAIN DITCH BEYOND CONTROL
This gully grew from a small ditch on the farm of K. W. Coster near Tigerville, South Carolina, and provides a graphic example of water erosion

A two or three-foot groove that the farmer could jump across has now widened to almost ten yards and in places has reached the astonishing depth of eighty feet. Such a deep, narrow gully is a serious human and economic hazard. If farm implements, tractors and carts drop in they cannot be retrieved. Livestock tumble in and are lost. Children must be kept away from it and even adults give it a wide berth. The sides are too steep and too high; its length is guarded by abrupt and vertical drops. In the dry season there was once found in it an emaciated dog that for days had been running up and down the barranca floor shut in on all sides by precipices it could not conquer.

In the vast *wind erosion* regions in the dust bowls of Texas and of the Dakotas, where there is little moisture and high winds, the soil, when vegetation is removed, soon commences to blow. Dunes arise and, once on the move, are exceedingly difficult to check. As they travel they increase in size and cover more and more land. Unlike the results of water erosion, which, if left alone, will in time heal themselves, the effects of wind erosion are cumulative. The older the dunes grow the larger and more devastating they become. Some authorities believe that most of the deserts of the Old World from Central Asia to the Sahara originated thousands of years ago in some such way as this. In the Navajo Reservation, from one trip to the next, travelers can see today the overgrazed land changing into red dunes. From the summits of the Hopi Mesas the eye scans a hundred square miles where patch after patch of overgrazed or overcultivated land is beginning to blow. Once the wind starts the dunes have not long to wait.

Along the margins of certain beaches of Oregon the natives for many years have been accustomed to pasture their stock. Grazing has led to overgrazing; the grasses that bound the shore hillocks and protected the coastal sandbars have been eaten away. Loosened from its vegetative cover the sand commences to blow and wind erosion sets in along the denuded beach. Dunes form and shift with every wind, working their way inland, covering up cultivated lands, farm buildings and highways.

Erosion pavements are complementary aspects of wind erosion. Where the top soil has been removed a hard smooth pavement of subsoil frequently appears, untillable and infertile. These wind pavements are now a common feature of the Dakotas and the Panhandles. In Wyoming a combination of both wind and water erosion has produced a special kind of *grazing* pavement. There, because of overgrazing, the ancient grasslands have given way to great areas of greasewood, snakeweed and sage. Between these unpalatable species the soft earth top soil has been blown or washed away; and it has left as a grim legacy a hard, gravelly pavement covered with coarse sand and small pebbles, infertile to plants, impermeable to water, and as (Continued on page 114)

AN ALFALFA FIELD GONE
Limed, fertilized and sown, the soil was carried off by one hard rain. At the foot of the slope was a deposit of 5000 square feet and three feet deep

THE MARCH of the MARIGOLD

By LOIS TORRANCE

Photographs from W. Atlee Burpee

It was not an uncommon sight this past summer to see a bright spot of yellow or orange in gardens, no matter how small or large they were. Almost invariably the flowers were those of the marigold. The most recent popularity of this flower is the result of hard and persevering work on the part of seedsmen.

The marigold has by no means been neglected in the past. The common varieties, the African and the French (having confusing names, because their native home is in Mexico), were brought to Europe in 1596 and 1573. No one knows who brought the seed across the Atlantic, but it may have been some roving Spaniard who introduced this popular flower to European gardens. The English gave the name French to the smaller of the two because the plant came to them from France, and they thought the larger one was native to Africa, where it must have been growing extensively. It is not surprising that there was some confusion as to the marigold's true home. Evidently the popularity of these flowers spread rapidly, as they were well known by the end of the Sixteenth Century. By 1775 they were found in Japan. In India, too, they were greatly esteemed by flower lovers.

BEAUTIFUL ADDITIONS TO ANY GARDEN

This remarkable variety, a tall, single French marigold named Flaming Fire, has flowers of different colors on the same plant. Below, Crown of Gold, a collarette marigold that was the first with odorless foliage to be offered to flower growers

Just how great a part this flower has played in religious ceremonies is not known. There is a legend that it was given the generic name *Tagetes* in honor of an Etruscan deity, who is said to have sprung from the plowed earth as a boy, just as the marigolds grow in the fields. The common name "marigold" undoubtedly is derived from Mary's gold. However, this marigold is not the flower frequently referred to in English poetry. This is *Calendula officinalis,* now known as the Scotch marigold.

The members of the genus are: African marigold, *Tagetes erecta;* French marigold, *T. patula;* sweet scented marigold, *T. lucida; T. signata;* and *T. tenuifolia.* A few years ago, in 1934, representatives of all these species could be found at the Floradale Farm of the W. Atlee Burpee Seed Company in California. At that time David Burpee was trying to produce an all-American flower. His object was to find, or if necessary create, a flower that would grow well in all American gardens. He sought one attractive in form, color, and odor; one that could be used as a cut flower, and would bloom profusely throughout the garden season. A flower with all these qualities did not seem to exist, but the marigold had most of them. Its greatest failings were its odor, objectionable to some, and its lateness in flowering.

In this hunt for "the flower" the seeds of as many marigold types as possible were secured and 640 separate plantings were made. Unfortunately all of the larger-flowered marigolds had odorous foliage. This odor comes from small oil glands on the back of the leaves. Unless a plant could be found without it, it would be useless to continue to use marigolds for the project. So many wonders have been created by plant hybridists that it

WITH OR WITHOUT

Usually one makes his choice of flowers in any one species by the color. With the marigolds, however, you decide whether you want those with or without the odor. In the photograph the Burpee Gold (without) towers above the Golden West (with). So take your choice.

seems to many that anything is possible, but this is not true. Nature must present in some form or other the desired characters, and the hybridist can then try to combine the desirable ones. Just as Mr. Burpee was giving up hope, he received a letter from a missionary in Tibet stating that he had found an unusual marigold that among other things had odorless foliage.

In 1934 the seed came from Tibet and was planted. It was *Togetes erecta,* and probably came from China or India, where it has been known for a hundred and fifty years. Evidently a mutation had occurred naturally or had been induced. The flower was unusual, having closely-curled disc petals of a dull yellow shade, and broad ray petals that stood out around the others. The flowers and the plant in general were small and late in blooming. This Tibetan marigold was not at all a promising specimen, but it did have the odorless foliage, because there were no oil glands on the leaves. It would have taken years to improve this marigold if Nature had not taken the leap herself. In a field of these modest flowers a large, early-flowering plant appeared. This plant seemed to have all the desired qualities. It resembled the Tibetan species in flower form, but, besides being more sturdy, it bore larger flowers of a bright golden orange that opened early in the season. This plant was carefully guarded, seed collected from it was sown, and more seed collected from the choicer plants of the second generation. By the almost magical performances of seed growers there was sufficient seed of this "Crown of Gold" collarette marigold to present to every gardener in 1937. Not only was this marigold unique in its odorless foliage and flower form, but it was the Gold Medal winner in the All America selections of 1937, having received the highest number of votes from the seedsmen in whose trial grounds it had been growing, together with other novelties, in 1936.

The development of odorless marigolds of the collarette type has not stopped with the Crown of Gold. This year two more will be found listed in many catalogs, a golden yellow and an orange yellow, called Yellow Crown and King's Ransom. In plant form these are an improvement on the Crown of Gold, since the plants are sturdier and have better foliage. In a number of gardens this past season the Crown of Gold had quite a struggle for existence. First the rabbits went after it, and then the Japanese beetles. This suggests that the oil that gives the odor is a protection to the plant.

The criterion in selecting a given variety has previously been one of color. Now with marigolds you decide whether you want them with or without odor. It occurred to Mr. Burpee that there might be other marigolds, perhaps individual plants of known varieties, that had odorless foliage. Among the vast marigold plantings at Floradale he found this to be a fact. The seed of a selection taken from trials of Guinea Gold, the first carnation-flowered marigold introduced, had produced plants without the odor. The leaves had the oil glands but they were not functioning. They seemed to be stopped up. One can see this when the leaves are held up to the light. This new marigold, which resembles Guinea Gold in color but is larger in flower size, is an earlier bloomer, more dwarfed and more uniform as a plant. Seed is now on the market as Burpee Gold. Offered with it is another variety—Golden West—so much like it that people not familiar with detecting small differences in flowers by the eye can distinguish the two only with the nose, for one has the odor and the other has not.

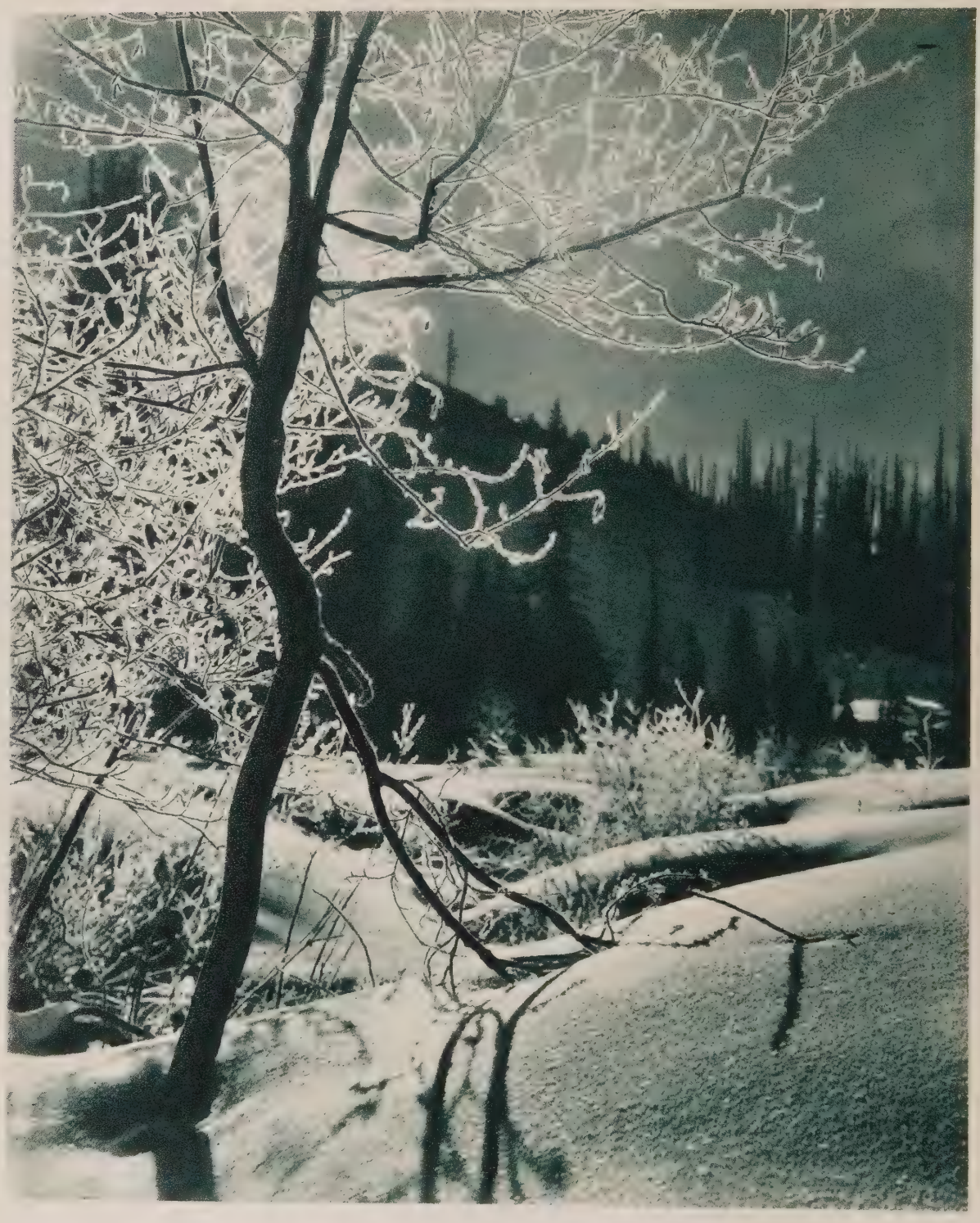
Such remarkable work has been done by plant breeders with the aid of genetics that it seems as if almost anything could be done. These new marigold introductions do closely meet all the requirements for the ideal garden flower, but as yet the flowers of African marigolds are available only in shades of yellow, orange, and gold; and of the French in shades of yellow, orange, and gold to a deep mahogany red. It would be glorious if there were other colors, too, perhaps a pink or a pure white. A blue would be out of the question because seldom, if ever, are the golden orange and blue shades found in one species. Flowers have been divided into two classes: one called the xanthic, which includes those ranging in color from an orange-yellow through scarlet, but no blue; the other the cyanic, including flowers ranging from an ultramarine-violet through crimson but no gold-orange. Both groups do have white flowers. The zinnias and marigolds belong to the xanthic (Continued on page 127)

WINTER BIRDS NEED YOUR HELP

Some time ago we offered awards for what we termed "spirit of the month" Nature pictures. Many interesting pictures were submitted. As a group they were graphic evidence of the size and varied climate of our country, for, to be sure, December in Florida or California is a real contrast with December in Maine or Michigan. Yet the camera is able to catch the spirit of the season in whatever region. These winning pictures will be published from time to time.

The scene above is typical of January and most of February in Michigan, and is the work of Louisa R. Gleason of Grand Rapids. This season, she writes, "always gives me a feeling of plenty of snow and contented waiting. Against its cold days animals have acquired their heavy winter coats and birds have learned where to find food and shelter. The bluejay and the bobwhites rest unconcerned in the midst of a world of snow with a sense of repose."

There is, we feel, an additional suggestion contained in Mrs. Gleason's picture. It is the thought of providing winter food for these and the many other birds that winter in our snow-bound regions. Man has developed a passion for cleaning up even the woods. Berry-bearing shrubs and seed-laden weeds have been cleared away in many places, making the normal winter food of birds difficult to find. The answer is that man should make partial restitution by providing feeding stations around the home and by periodically spreading food in sections where such birds as the quail are to be found. Thus does this picture suggest another spirit of the season—the spirit of giving; the spirit of friendly thought for wintering birds, as well as for our friends and loved ones.



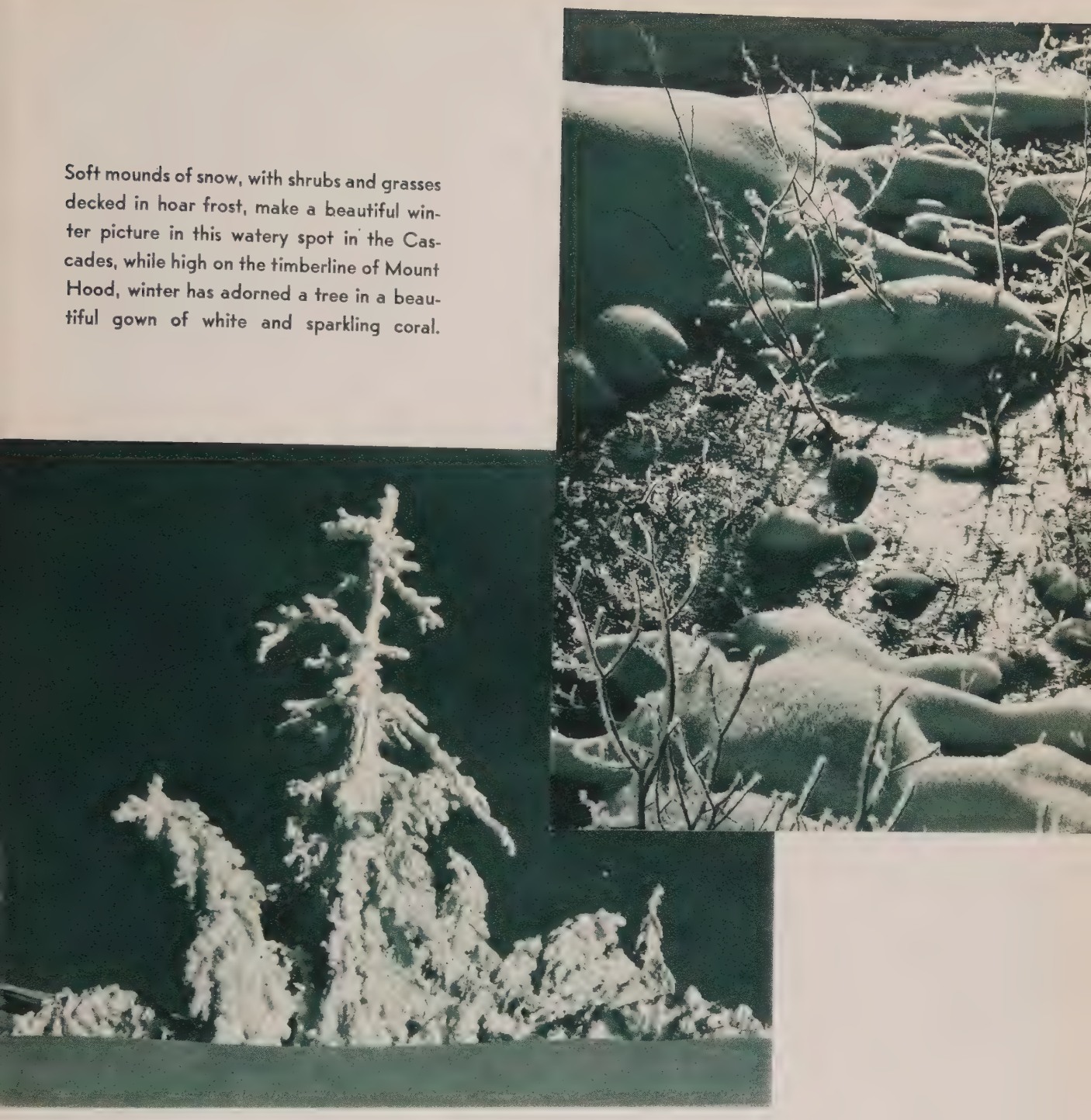
SNOW MOODS

As recorded by Ray Atkeson

Weather is proverbial for its varying moods. It may seem sullen, sparkling, uncertain, angry; in fact, it may be indicative of many faults and virtues that are attributes of man. There is a charm, however, in the moods of all the seasons, but for sheer beauty, the scenes of winter, when King Boreas and Jack Frost conspire in landscape decoration, may often hold the greatest charm.

From his home in Portland, Oregon, Ray Atkeson has taken out his camera to seek out winter's secrets, whether on the upper slope of Mount Hood in the Cascade Mountains or along the banks of some stream at a lower altitude. Here we see the beautiful effect presented by a brookside tree, as its limbs and twigs, seemingly dipped in hoar frost, glisten in the early rays of the rising sun.

Soft mounds of snow, with shrubs and grasses decked in hoar frost, make a beautiful winter picture in this watery spot in the Cascades, while high on the timberline of Mount Hood, winter has adorned a tree in a beautiful gown of white and sparkling coral.



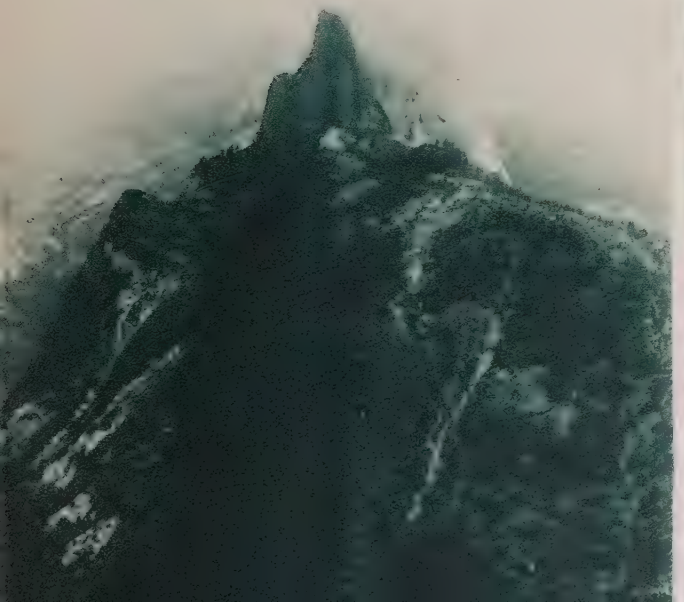
On the next page we see a picture that breathes the spirit of a mountain peak in winter—the wind-driven snow banner, the old trees swathed in white, the summit of Mount Hood buried beneath a drifted blanket. Such slopes as these, in such a surrounding of wintry beauty, are a lure to those outdoor lovers who ski and snowshoe.

In the lower picture one can feel the silent beauty of the snow in a forested region when the winds are resting and the sun paints shadows on a white background. In the center, just visible above the hillock of snow, may be seen the cabin chimney of the Wy'east Climbers, western mountaineering, hiking and camping group.

While tenderfeet hug their fireplaces, Nature is getting ready for the usual summer rush of sightseers and outdoor lovers that visit her wilderness areas. A good supply of snow to water the hills and valleys and insure, in the succeeding months, the verdant hues and riotous colors for which she is famous is the first step in her preparation. Above is pictured a typical Rocky Mountain winter scene, this one being Maligne Lake, Jasper National Park, Alberta. Photograph by J. A. Weiss; courtesy of the Department of Interior of Canada. Banff National Park, another popular Canadian vacation resort, has, as one of its attractions, this tumbling waterfall, picturesquely named the Giant's Steps. Canadian Pacific Railway photograph.

Half Dome, in Yosemite National Park, California, a mountain whose summit is cleft in two, is an outstanding example of Nature's carving in granite. This landmark, visible for many miles to the high Sierra visitor, was photographed by James V. Lloyd, Park ranger.

The Grand Canyon for many years has been a mecca for those seeking the ultimate in breath-taking, ever-changing colorations. This view is from Point Imperial, the highest point on the North Rim of the chasm.



The Scorpion and Its Young

As recorded by Lee Passmore

Scorpions inhabit warm countries of both hemispheres, living on the ground under logs, stones, or in shallow excavations that they dig with their front feet, which are well adapted for this purpose. Their segmented post-abdomen is sometimes used as a sweep to push the loosened earth out of the cavity in which the creatures live. They are nocturnal, remaining hidden during the day, but issuing forth at night to search for prey, which consists of insects and spiders. These they seize with their strong pincer-like claws, and while holding their victim they sting it to death. Venom from the poison gland, with its needle-like sting, soon ends the struggles of the victim, after which it is sucked dry of its juices by the scorpion. There are a number of genera of scorpions, divided into several species that differ from one another in comparatively unimportant points, so that the following account of my observations, which are concerned principally with the way the young are hatched, will apply almost equally well to any of them. The photographs, showing the female before her eggs were laid, and the mother and her young soon after, were made in California late in August.

Our first picture is of a shiny-stinged scorpion, *Anuroctonus phaeodactylus,* which not only has a shiny sting, but one of a most peculiar shape. Between the sting and the base, but nearer the latter, there is an inflated structure. Probably the term swollen-sting, or bladder-stinged scorpion, would be equally appropriate. Scorpions run quite rapidly, with the tail curved over the back, and they can throw the tail in any direction, using it for both attack and defense.

Here we see the female partly exposed as she occupies her burrow, which was located under a large stone. When the stone was removed to make this photograph possible, the scorpion crawled backwards into the excava-

tion, where she tried to hide. There she remained while the picture was being made. She seemed somewhat uncomfortable when the sunlight streamed into her dark chamber. The hard parts of many insects found in her burrow indicated that she had recently feasted.

In the first photograph on this page the female is shown with her abdomen greatly distended. She was carrying about thirty-five eggs, in which the young were developing. Scorpions are viviparous, bearing live young. The eggs, which are oval in form, lie in a cavity in a side passage of the oviduct. Fertilization occurs either in this cavity or after the egg has escaped into the oviduct. Further development takes place in the oviduct; and when each egg is laid, the mother removes the shell and immediately devours it. When the little scorpion is relieved of his covering he is able to move about and take his place with the others. On one occasion the mother took up one of the tiny creatures in her claw and placed it on the opposite claw. The little fellow then found his way along that member to her back where his brothers and sisters rested. The first of the eggs were laid before daylight on August 30, and the last one of the new-born scorpions found his way to his mother's back at four o'clock the following morning. I watched for several hours to see if the scorpion would lay any more eggs, but she did not.

The mother scorpion seen here with her rapidly increasing family, now ten in number, resented my intrusion, and ceased all movements while the stone that covered her burrow was raised. In order that I might observe her actions, I tried raising the stone after dark, and with the hand flash-light occasionally illuminated the spot occupied by the scorpion. Apparently the dim

light did not disturb her, and I was successful in seeing most of her exceedingly interesting actions. She carefully raised her body from time to time, resting in that position for a few moments, after which she moved backward a few inches until her mouth parts were directly over the egg she had just deposited. Only a small part of the egg was visible at any time. Soon the young scorpion appeared between the large claws of the mother and later it was lifted by her and placed on the opposite claw, this action enabling the little one to join its fellows on the back of the parent.

The seven young scorpions shown here were photographed by flash-light at the entrance of their home. Several of the little creatures left the burrow where the mother rested with her family, and wandered a few inches from the nest. They moved very slowly; sometimes remaining motionless for a full minute. They were now one week old, and the segments of their tiny bodies were distinctly noticeable. I never discovered them eating anything, yet they appeared to be growing larger, apparently without nourishment.

This photograph of a young scorpion shows its almost transparent appendages. The actual length of this little creature was one-half inch; its width was one-quarter inch. It was photographed within an hour after it came from the egg.

HUNTING DOG AS NURSE

This is a true story of two little fawns that were deserted by their mother in a European forest. She had been frightened away by some poachers who tried to catch her young ones. Luckily the forester, who, with his dog Diana, was making his daily tour of inspection, noticed the fawns, which were crying pitifully for their mother. They were nearly exhausted. The forester took them home, carefully carrying them in his arms. When offered a baby's milk bottle, they willingly accepted the unfamiliar food. Soon Diana, who showed much sympathy and understanding for the helpless creatures, took up the duties of nurse. She would go to the kitchen asking for the milk bottle, and in her great jaws she would carry the milk to her protégés. Patiently she would sit still until the fawns were satisfied. If she held the bottle too high, she would drop her head or change her position to make it more convenient for the sucklings. In the beginning the young deer were rather shy, but soon they became familiar and trustful both with dog and humans. And now one can find them sun-bathing with Diana on the verandah, going for a walk in the nearby woods or resting on the grass. Diana is always present. She seems to have lost all of her hunting instincts, and trebled her motherly ones. Photographs from Paul Popper, London.

Nature's playground in the Bad Lands of the Imperial Desert, with Salton Sea in the background.

SAND CONCRETIONS

Playthings of Nature

By CHARLES VAN FLEET

We had stopped at a steaming desert waterhole to refill the canteens. An old miner was rolling up his pack in the shade of a fan palm.

"Any luck?" I said by way of introduction.

"Only a color, son," he answered. "I've been out for two weeks and am going in for another grubstake. Take my advice and don't waste your time around here. Hunt over yonder about Signal Mountain, there's gold in them canyons."

"But we're not looking for gold," I replied.

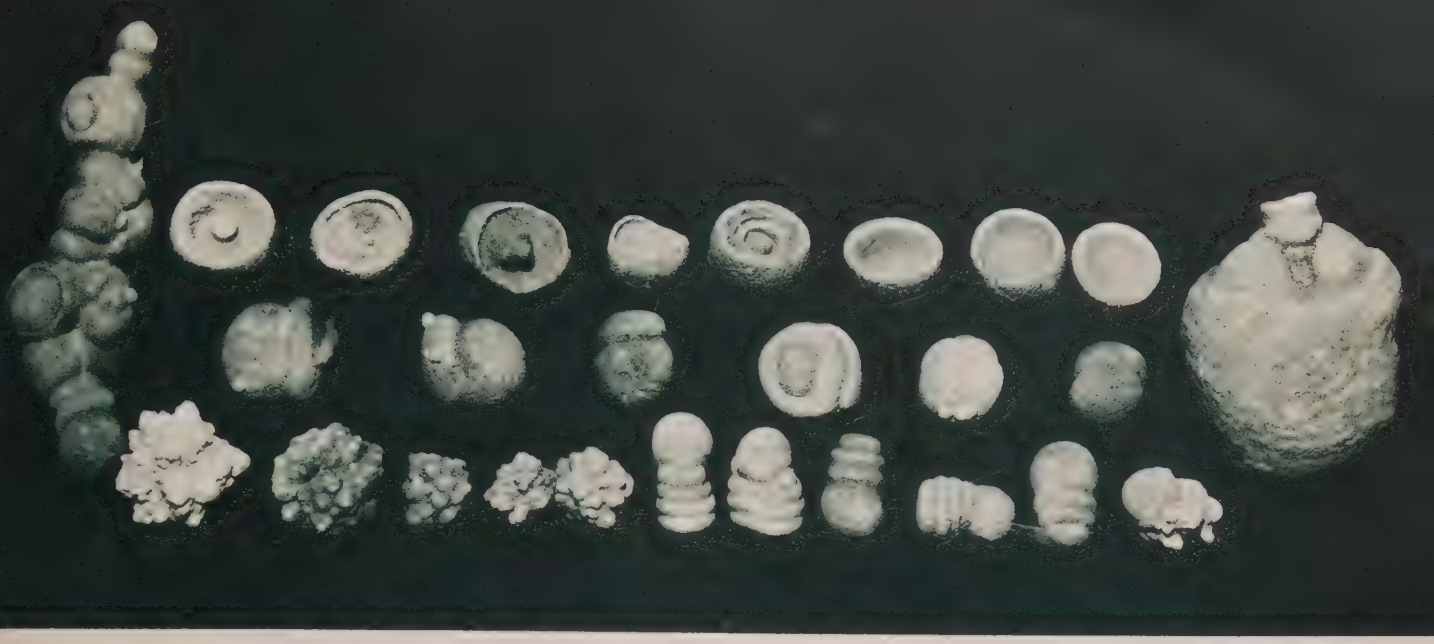
"What on earth be you looking for, then?" he queried.

"Sand," I said, seriously.

He handed me a cup of water and from then on eyed me suspiciously. He had seen people lose their minds in that dehydrated land before, and he wasn't taking any chances. Of course he did not know that over the ridge we had a powerful car, radio equipped, provisioned for five weeks, and stocked with many gallons of water. So as we trudged on across the dunes we enjoyed a hearty laugh.

But at least I had spoken the truth, we were searching for sand—in the form of concretions. And along the shore of a Pleistocene beach we found them, mound after mound just as Nature had left them in the distant past. These miniature hills, sitting side by side, would reach for perhaps half a mile and each contained distinctly different designs. There were round ones from the size of marbles to cannon balls, long ones shaped like beets and carrots, perfect six-sided crystals, and others resembling peanuts and acorns. But most fantastic were those forming right- and left-turn spirals, tapering to-

Spiral concretions from the Imperial Desert. Note the right- and left-turn spirals. The mystery of their origin remains unsolved.

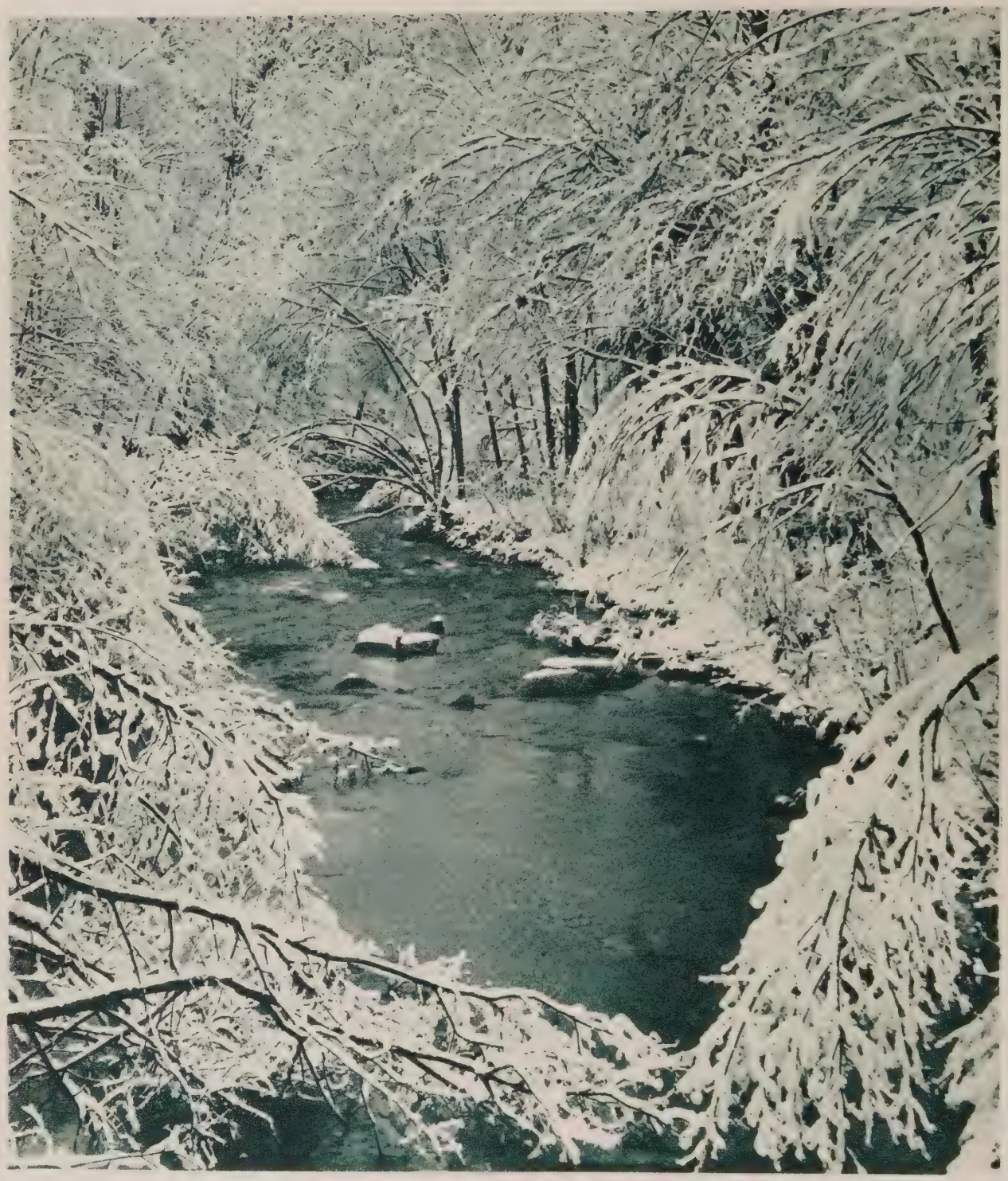


Nature's bullet molds and powder flask at the right. Below, sand concretions of many shapes. All were formed according to a definite law; they range in size from a fraction of an inch in length to large ones weighing several tons. The pile of small ones at the left are perfect six-sided crystals. Note particularly the "acorns" in the center foreground and the "peanuts" at the center right.

ward one end, and all pointing offshore along the ancient beach line.

The growth of the others could be explained. At one time the entire mass was in a plastic state with solutions seeping through it. Particles carried by the solutions united under a definite law to build up the various shapes. Finally the mass hardened. Then through the countless ages of erosion the softer matrix weathered away, leaving the concretions free. But this did not account for the spirals. Specimens of these were sent to eminent geologists, who all agreed that they were formed in accordance with some definite law, but were before unknown to science. Their composition proved to be approximately thirty-five per cent calcium carbonate and sixty-five per cent sand. They have been named "Hazen spirals" in honor of their discoverer Guy Hazen, my companion on the trip, and field paleontologist for the Frick Museum of Natural History. But what strange combination of forces caused them to be formed in that weird land, and nowhere else?

It seems as if Nature, when she moulded the great mountain peaks of that region, had some "dough" left over, and in a jovial mood had shaped these spirals as playthings for the desert Gods.



The quickening pulse of our streams portends the approach of a new season—spring. But winter, as if in a jealous and rebellious mood, may now determine to put on his final display of power and splendor, rivalling the best show of any season. The trees and shrubs, dressed in virtuous white, bow their heads as if to say, "The King is dead. Long live the King." This picture was taken a few miles south of Renovo, Pennsylvania, in the Sproul State Forest, by P. R. Hicks of Mill Hall.

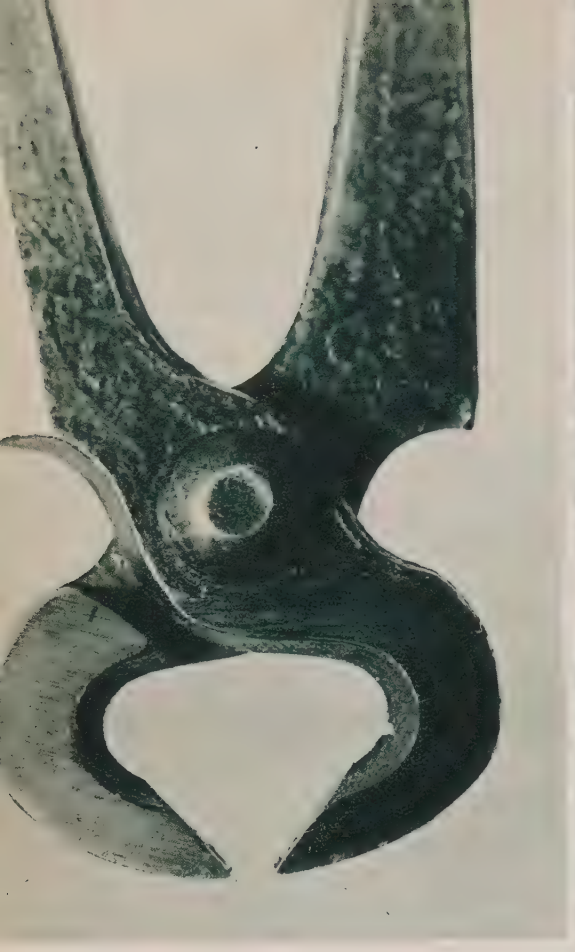
MAN'S INVENTION?

Uncredited photographs by
Leonhardt and Croy, from Black Star

The brilliant mind of man has created many useful objects that we now accept as everyday conveniences, former luxuries that have become commonplace through use. Some of them are absurdly simple: the hinge, for example, that permits us to leave open or to close the entrances and exits of our houses; or the spring, that curious metal contrivance that, when we forget to shut the door, does the job for us.

And yet, were these simple gadgets really the brain-child of a master-mind? We think not, as Nature had them long before man appeared on the earth. The first man who became fond of sea food knew the oyster had a hinge, and a powerful one at that, as he probably chipped many a stone knife while trying to pry one open. However, thousands of years passed before he made use of the hinge. Nature has found use for the spiral spring, also. Climbing tendrils of many plants grow cork-screw fashion, and when the growing tip finally attaches itself to a solid object, the tendril "gives" and "takes up slack" as the force of passing breezes requires. On this and the next two pages are pictured a few of man's "inventions" that Nature used before man saw the light of day.

First pictured is an ant's-eye view of a small frog, showing his suction-pad feet that enable him to cling to his lily-pad home. Quite similar are the rubber suction discs that hold your defroster on the inside of your windshield during icy weather. If you moisten the piece



of rubber before pressing it against the glass, you will find it will stick all winter. (That little trick was learned from the frog also.)

Although the clothespin and the stag-beetle's jaws are never connected in thought, they both have the same gripping action; the pin to hold the clothes on the line, and the beetle's jaws for some purpose not clear to us.

This magnified view of a spider's jaws, although a trifle evil-looking, is quite similar to the jaws of the pincers. One is for grasping the spider's victim, the other for grasping almost anything. Pictured below are the spiral springs we spoke of on the previous page, and a hornet apparently examining a man-made counterpart of her stinger, the hypodermic needle. The injection needle pictured here is almost identical in construction to the hornet's stinger, but fortunately, the former is used to relieve pain, while the latter, as any barefoot boy can tell you, may cause a painful sting. In this instance, at least, man has improved a bit on Nature's model, by constructing a device that helps humanity.

Pictured here are three more interesting comparisons between Nature and man-made tools, new to the layman but familiar to the man with the microscope.

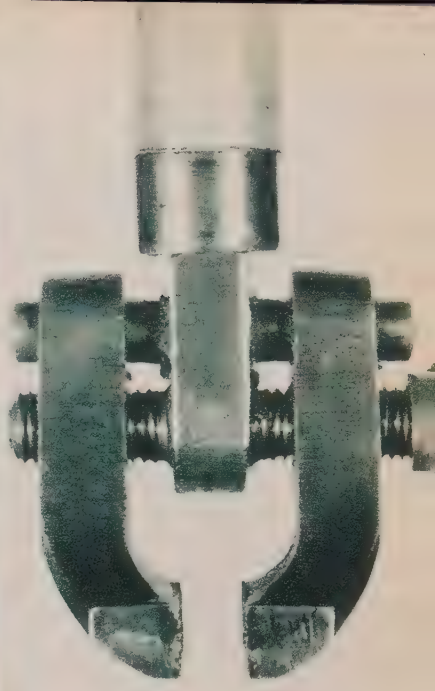
First we see the head of a female ant with her dangerous-appearing jaws, beside one of man's most useful tools, the clamp. In proportion to her size, the ant's clamp is much more powerful than man's. All of us have seen a tiny ant carrying a load ten times its size.

The awl, used by cabinet makers and leather-workers to pierce holes in their material, has its counterpart in the wasp's stinger, shown here magnified many times. The keen point of the stinger enables the wasp to penetrate the skin of his victim with ease.

Shown below, greatly magnified, is the extended trunk of a bumblebee. It is the fine hairs, clearly visible, that collect the pollen from each visited flower. The brush, similar in action, is used by the chemist cleaning his test tubes after an experiment, and, in larger size, by the plumber who clears the accumulated grease and dirt from the outlet of the household sink.

There are many other instances where man, had he had the vision, could have learned many things years before he did. Glass, for instance, has been found around the slopes of volcanoes in the form of fused quartz, and certain kinds of fishes carry electrical charges that can knock a man down. The air and the water pump are modeled on one of Nature's most wonderful machines, the heart.

And so we find that man has been somewhat backward since his appearance on the surface of the earth. Nature placed these things before him, but they went unnoticed for a long time. It remained for the scientist and the inventor, men with keener minds than the average person, to improve on Nature's tools.

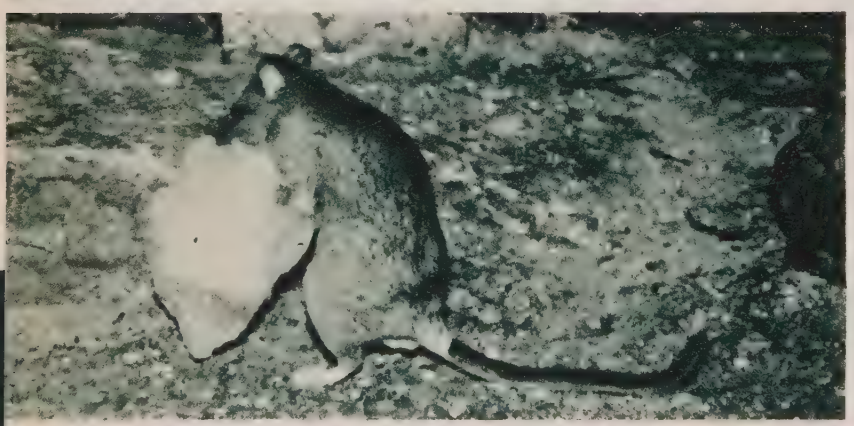


Mammals Here and There

Less vivid in their colors, and deficient in musical ability, mammals are less attractive generally than are birds. But whether they yield their furs to man, or furnish him food, or filch his crops, or merely amuse him, they are always interesting.

This raccoon was photographed by W. J. Schoonmaker of Rensselaer, New York. The subject's ringed tail is hidden, but all in all this animal gave splendid cooperation.

It is impossible to photograph a mole underground, where he spends most of his time, and almost equally so when one catches him out of his burrow, for he is then frantically intent on getting back home. This *Scapanus* was photographed at Durham in the Sacramento Valley by Edwin G. England, Jr., after a dozen attempts.



Some people think that woodchucks are good for nothing, but W. J. Schoonmaker, who has made an intensive study of their ways, shows by this picture that they make good subjects for professionals or amateurs. So sorely threatened are many of our once-numerous species that the scarcity of mammals of this size may soon make the woodchuck a rarity even to the country boy.

This Alleghany cave rat, our only eastern species, was caught by the camera of Charles E. Mohr of Reading, Pennsylvania, as it was decamping with someone's sandwich. Its relatives of the West are called trade-rats, but any of the tribe may forget to bring back the equivalent of the booty they carry away.

As red squirrel, pine squirrel, Douglas squirrel or chickaree, this little animal is or should be known to every resident of nearly every part of wooded America. It seems incredible, and certainly is to our shame, that this little creature should now be sought in many sections as a game and fur animal.

This pine squirrel was photographed by Les Taylor of Jardine, Montana, as he began to operate on the fruit of a lodgepole pine.

★ Conservation ★

A part of Nature Magazine each month is devoted to the expression of practical opinions on the vital issues affecting our use and abuse of natural resources, including wildlife, and dedicated to the purpose of assisting Americans to play a militant part in the attainment of constructive conservation aims.

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THE PRESS AND ★ REORGANIZATION

Without seeing even a glimmer of the light of day in the special session of Congress, the proposed government reorganization omnibus bill is, as we go to press, still on the legislative shelf. Such strong opposition has developed in many quarters, and in several sections of the country, that solid Congressional strength has been built up against this blanket proposal.

We have presented our views explicitly in these pages. We have urged that any such legislation present a definite plan of reorganization; that administration of our renewable natural resources be kept in one place; that practically all of these activities relate to agriculture and should stay in the Department of Agriculture. There is no need for us to repeat our reasons for these views.

It is, however, pertinent to quote some of the editorial comment in our newspapers. The *Missoula Missoulian,* for example, declares that "it is advisable for the people of the West, which would suffer most from some of the changes contemplated in it, to use what influence they can bring to bear to prevent the transfer of the Forest Service . . . with the additional raid on Civil Service provisions contemplated in the projected measure."

"It becomes apparent that the reorganization bill is due for hard sledding against the powerful forces of true conservation," says the *Grand Rapids Press.* "A majority of the outstanding conservationists of the country are lined up against it. These added to the forces opposed to the measure for other reasons—especially because of its dictatorial tendencies—may form an insurmountable barrier to its passage.

"Reorganization is desirable only if it is to accomplish efficient aims and a better type of administration. So far there is no evidence that this is assured. And it should be specific, instead of a general blanket order to hand additional powers to the Executive. Mr. Pack clearly states the case with the words:

" 'There seems to be no logical reason why legislation cannot be drafted that would specify exactly what transfers should be made; what structure for research and administration . . . should be created. Such a proposal could be considered on its merits.' "

In the opinion of the *Medford* (Oregon) *Mail Tribune* "where the record of conservation is what it is under the Department of Agriculture, we would dislike to see it turned over to another department, for a period of confusion and disorganization might well ensue, which would be unfortunate in its consequences and result ultimately in no constructive benefits."

"Commercial timber today is grown like a crop," points out *The Christian Science Monitor.* "Timber culture has become an agricultural science. Soil conservation, plant entomology, plant industry, and agricultural extension service are related to it. . . . Moreover, timber is a renewable natural resource, unlike coal, oil, minerals, or the unique natural manifestations found within National Parks.

"Unified direction of the functions relating to the products of the soil, as enumerated above, would seem properly to be grouped under that department having supervision of the productive use of the land."

The *Flint* (Michigan) *Journal* asserts that true conservationists "dread the day when the natural resources of the country might be turned over to any individual's theories, to be at the mercy of any individual's ambitions."

The *Ithaca* (New York) *Journal* declares that the threat of the transfer of the Forest Service is the worst threat in the bill and "should be blocked." The *Jackson*

(Michigan) *Citizen-Patriot* feels that "government enterprises can suffer by being shunted around from one department to another in Washington," and cites a sad local example of the Interior Department's conservation ideas.

These and other comments by editors give particular point to the logical demand that any reorganization plan should be embodied in a specific bill and be considered on its merits, and in no such blanket way as is now proposed.

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DEER IN ★ WISCONSIN

During the recent hunting season in Wisconsin a controversy arose with respect to deer hunting that provokes thought and bears upon a point we have made before editorially.

For a number of years Wisconsin has had a policy of alternating the seasons for hunting bear and deer. It was a deer-hunting year in 1936, and hunters' reports indicated a kill of 30,000 bucks, not to mention several thousand does and fawns "killed by accident." It was, therefore, to have been a closed year for deer in 1937. However, the Conservation Commission found itself sorely in need of about $100,000 to finance its game division. So an open season was announced.

Many sportsmen joined with conservationists in protest, and these protests brought about a reduction in the number of open days from ten to three. The result was that, with no snow in the woods until the third day, the kill was less than half that of an average open year. Serious inroads on the deer population were not made.

It is not, however, the number of deer killed that merits attention. Two counties—Sawyer and Vilas—set about to oppose the season by having land posted against hunting. These counties depend largely on summer resort and tourist business. Their residents have come to feel that live deer are valuable as a summer attraction. They didn't relish the idea of open seasons two years in a row. Some other counties contented themselves in vigorous protest against the ten-day season, thus bringing about the cut. Many sportsmen joined in these protests.

The action of Sawyer and Vilas counties, however, became the *cause célèbre.* Sportsmen's groups in other counties with few deer, or none, adopted resolutions calling upon the Conservation Commission to withhold all conservation money from these renegade political subdivisions. The Conservation Commission which, incidentally, bases its policy on seasons largely on the advice of the Sportsmen's Advisory Council—slapped at these insubordinate counties by demanding that all illegal posting of land be investigated and prosecuted. (Lands registered under the Forest Crop Law, which provides State aid in reforestation, cannot legally be posted.)

The thought-provoking statement in the Commission's resolution of rebuke, however, says that the conservation department should endeavor to protect the interests of the hunters and fishermen from illegal practices "by persons who are selfishly inspired because of their interest in commercializing in some manner the wildlife assets of the State." The residents of Sawyer and Vilas counties wanted to keep a sufficient stock of deer alive and visible as an attraction. And the Conservation Commission needed a hundred thousand dollars it could get only by selling licenses to kill the deer.

Who do you think was doing the commercializing?

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It is encouraging to note that the list of protected birds in Pennsylvania has been increased by the addition of the turkey vulture, red-tailed hawk, red-shouldered hawk, broad-winged hawk, marsh hawk, rough-legged hawk, duck hawk, pigeon hawk and barred owl. The three hawks remaining on the unprotected list are the goshawk, sharp-shinned hawk and Cooper's hawk. The great horned owl and the snowy owl are also unprotected, as are the crow, bluejay, English sparrow, starling and kingfisher.

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Proper protest is made to the Screen Directors' Guild by the Emergency Conservation Committee against the vicious Nature-faking in the films showing an eagle carrying off a "child". Still pictures from this film have been widely published, showing that the faking was poorly done with a stuffed bird controlled by wires carrying a doll. The effect of such a film would be to lend further support to the ridiculous stories about the lifting power of the eagle, and its viciousness. The result is additional and unjustifiable animosity toward our national bird. We trust that the film will not be released.

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Intensive study of the mink with respect to its reproductive cycle is being undertaken through a cooperative research project between the U. S. Biological Survey and the Carnegie Institution of Washington. The object of the study is to develop information that will be of value in mink farming. It is also hoped that the information gathered will be useful in management of this fur-bearer in the wild. The study will be conducted by Robert K. Enders, department of zoology, Swarthmore College.

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Acquisition by the U. S. Biological Survey of 16,067 acres of land in twelve wildlife refuges has been approved by the Migratory Bird Conservation Commission. The land, to be purchased at an average cost of $2.55 an acre, is added to the following refuges: St. Marks Migratory Waterfowl Refuge, Florida; Upper Souris Migratory Waterfowl Refuge, North Dakota; Willapa Harbor Migratory Waterfowl Refuge, Washington; White River Migratory Waterfowl Refuge, Arkansas; Hart Mountain Antelope Refuge, Oregon; Waubay Migratory Waterfowl Refuge, South Dakota; Seney Migratory Waterfowl Refuge, Michigan; Charles Sheldon Antelope Range, Nevada; Camas Migratory Waterfowl Refuge, Idaho; Valentine Migratory Waterfowl Refuge, Nebraska; Savannah River Wildlife Refuge, Georgia; and Delta Migratory Waterfowl Refuge, Louisiana.

Things to Think About

Holding much hope for future erosion control and water conservation, New York State's reforestation program is now in its eighth year. To date a total of 206,079,296 trees have been planted on lands purchased or contracted for by the State Conservation Department. Commissioner Lithgow Osborne points out that while no appreciable results from these plantings, so far as flood control is concerned, may be expected for a decade, they are certain to be important factors in the future. Lands acquired have been strategically selected in important watershed areas.

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Promising to be an important factor in conservation in Texas, the Texas Federation of Nature Clubs was organized in Dallas on November 13, 1937. Its object is the advancement of knowledge of Nature and conservation activities. Dr. Leo T. Murray of Waco, director of the Baylor University Museum, was chosen as president, and Jerry E. Stillwell of Dallas as Secretary.

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Existing courses in colleges and universities concerned exclusively with or bearing upon wildlife management are discussed in a leaflet of the U. S. Bureau of Biological Survey. Anyone interested should ask for Wildlife Research and Management Leaflet BS-98.

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Indication of the extent of cooperation that may be expected from the outdoor advertising industry and users of billboards is found in a report of Dr. Raymond L. Ditmars, president of the Westchester County Conservation Association. Following a survey of Westchester highways, exclusive of the park system, an appeal was made to every firm using billboards for advertising in scenic or residential areas. Fifty-nine firms were approached. Of these twenty-nine failed to reply to the appeal; five acknowledged the letter without statement of any policy; eight offered cooperation with definite reservations; eight promised future cooperation; nine acted at once.

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During the past few years the National Park Service has expanded its activities and taken on the administration of a wide variety of areas. Its responsibilities now range in variety from little triangles of ground with a couple of park benches to Yellowstone National Park. An interesting suggestion for further expansion comes from the editor of the Memphis *Press-Scimitar*. He writes:

> In the establishment of the Cape Hatteras National Seashore, comprised of five islands off the North Carolina coast, the National Park Service will be preserving for all time another great phase of nature unmodified by the activities of man. The seashore, where life began, will take its place with the mountains of Rainier and McKinley; with the geysers and bears of Yellowstone; the picturesque erosion of Grand Canyon and Zion; the trees of Redwood and Great Smoky.
>
> There is one great natural feature not yet included in a national park. That is a river. True, there are rivers in national parks, but no river, or large part of a river, has been set aside as a national park's reason for being. Yet the river stands equal with the seashore and the mountain in the mind of man as one of the great parts of Nature.
>
> The National Park Service might look around for a river not already so built up and polluted that it cannot be restored to its pristine beauty. The park should start with the headwaters, of course, with every contributing little spring included. It should include a great deal of the river's main channel—at least enough to show the waters flowing strongly and deep enough to carry boats. To see a great river, quite free of mud, and sparkling blue in the sunshine, as it was when the first white men came, would be a sight that Americans would travel miles to see. It would inspire them to reforest and clean up all our rivers as far as that is practical.

If the National Park Service can find a stream that is not filled with the pollutions of industry and is not busily engaged in carrying away top soil from the surrounding countryside, or could be "restored to its pristine beauty," then it should certainly grab it and make a river park out of it. The chances of finding such a river are pretty slim, the more to our shame.

• • •

Acquisition of 18,000 acres of wild forest land north of Mt. Katahdin, Maine, for addition to the present Baxter State Park, has been announced by Percival P. Baxter, former Governor of Maine. Mr. Baxter had already acquired six thousand acres, including the mountain, and given this in trust to the State as a park. The new addition would be transferred on the same basis. Mr. Baxter also hopes to acquire more acreage for further expansion of the Park, which will be maintained in its primitive state and as a wildlife sanctuary.

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The editor of the Iowa State Conservation Commission's news releases has discovered that out in California Mr. Wren, Mr. Partridge, Mr. Fox and Mr. Crain were arrested and fined for violation of the fish and game laws.

• • •

C. Edward Graves, secretary of Friends of the Western Mountains, in a letter to the *Christian Science Monitor,* suggests that if the irrigation tunnel through Rocky Mountain National Park is permitted then the logical course is to change the status of this reservation to that of a National Forest. There is much merit in this idea. In certain ways Rocky Mountain National Park is not up to the best National Park standards, for example its approach through Estes Park, which is a rather sad introduction. More important, however, is the fact that the Park should never have been accepted with the reserva-

tions in favor of an irrigation project in the future. Mr. Graves, we believe you have something there—as the current phrase goes. It is an issue that re-emphasizes the need for restoring the highest National Park standards.

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During the year ending June 30, 1937, sales of Federal migratory-bird hunting stamps—known popularly as the duck stamp—totalled 603,623. The most stamps were sold in Minnesota, Illinois, Wisconsin and California. This figure gives an accurate count of the total legal hunters faced by the migrating birds each fall. Proceeds of the sale are turned over to the Biological Survey for establishing, maintaining and administering migratory bird refuges. The dollars derived from this source, however, represent but a meager contribution toward the restoration of these birds annually destroyed by hunters.

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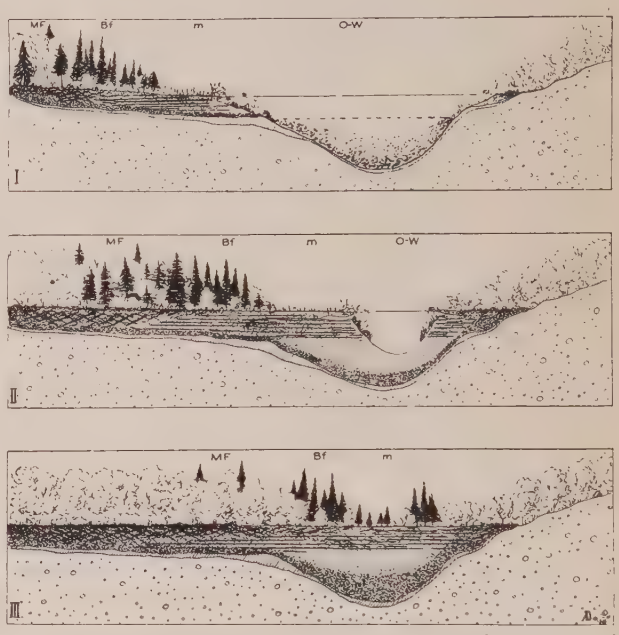
SAVING ★ ★ PEAT LANDS

"Until recently there has been little concern about the growing seriousness of abandoned, unproductive peat land in many states and the prevalence of destructive fires in overdrained areas of peat and muck. It has not been appreciated that, by reclaiming marshes and other types of peat land, a process of nature was stopped whereby rainfall was absorbed in peat materials and stored as a dependable water supply, and that desirable conditions closely associated with plant communities and many forms of wild animal life had been effectively destroyed. It was not realized that peat land had been accumulating and conserving rainfall and melting snow through countless centuries and had built up a balanced relationship between vegetation, wildlife, ground water, and stream flow.

"The drought of recent years with the resulting dust storms, the disastrous overflows by rivers, and flood hazards in more than a dozen states, the progress of soil erosion and silting, and the continued falling of ground water to lower levels, have given new emphasis to present and prospective measures for planning selective land use and for long-time conservation of submarginal land including peat resources.

"Today it is being recognized that mistaken practices of land use are a public as well as a private liability which can be dealt with effectively only by coordinated effort. The harmful consequences extend throughout the country and especially through many drainage basins and watersheds. A beginning must be made in the solution of peat land problems and in the conservation of peat resources for future needs. It is of primary importance to set aside submarginal areas of peat, including marshy lakes, bogs, and swamp forests unsuitable for agriculture, in order to provide natural storage basins and assure a dependable supply of water, and to promote their development as protective areas for migratory and other wildlife."

The above three paragraphs are quoted from an article in *American Wildlife* by Dr. A. P. Dachnowski-Stokes, physiologist of the Division of Soil Survey, Bureau of Chemistry and Soils, of the United States Department of Agriculture. They are significant because they concern some eighty million acres of land largely unsuited for agriculture and almost entirely not needed for producing vegetable crops. Drainage of these lands for promotional schemes, or for other unjustifiable reasons, has contributed to the lowering of water levels and destroyed many valuable areas for waterfowl breeding. The percentage of failure among agricultural attempts on drained peat lands is appalling, and the majority of the failures are due to ignorance of which type of soil would be suitable and which not. It has been a haphazard business in which millions of dollars have been wasted and myriad hopes blasted. And with it all, areas of great value to wildlife have been sacrificed.



This diagram illustrates three major stages in the origin and formation of peat land. Several peat-forming plant associations are shown displacing one another and giving rise to a sequence of different layers of peat. They represent aquatic, marsh, bog shrub, and swamp forest vegetation, which contribute to the formation of sedimentary, fibrous and woody peat respectively. The effect of vegetation in developing peat land may begin at either extreme condition in the moisture relation; i.e., in open water of lakes, ponds and stream channels, or on flat upland, sandy plains and even on bedrock normally deficient in moisture. It shows the general successional relations between vegetation stages and alludes to the influence each has in absorbing rainfall, retarding run-off, storing water supplies over periods of relative drought, raising the ground water to higher levels, and equalizing the flow of springs and rivers.

The sketch aids also in recognizing the vital relations that areas of peat bear to a well considered plan of land, water and wildlife conservation, and to working out an effective program of restoring to natural conditions the burned-over, deteriorating, and abandoned types of peat land, and utilizing them primarily in the interests of economic, social and recreational values of wildlife.

In any plan of land utilization, peat areas are important. Their drainage for the uses of agriculture, or the return of drained areas to wildlife purposes, should be based upon accurate knowledge of their best uses. Dr. Dachnowski-Stokes has been carrying on such studies for a number of years, and has published a number of bulletins on the subject. Even so, there is need for continuation and extension of these studies to the end that an adequate knowledge may be available to those directing land use programs.

WHAT IS IT? THE INQUIRING MIND WILL FIND THE ANSWER

The Nature trail offers an opportunity for observation outdoors and the notes made on the trail will lead to further study and wider knowledge later on

Nature Trails and Games

Some helpful suggestions for group activity outdoors

By MARIE E. GAUDETTE and LOU WILLIAMS

Photographs courtesy Girl Scouts, Inc.

This article will be useful to leaders of groups of young people and help to make Nature Study in the open both informative and entertaining. Miss Gaudette is connected with the program division of the Girl Scouts and Miss Williams is with the Department of Geology of the University of Chicago. This article is based upon practical experience both have had with Nature trails and Nature games in work with girl summer campers.

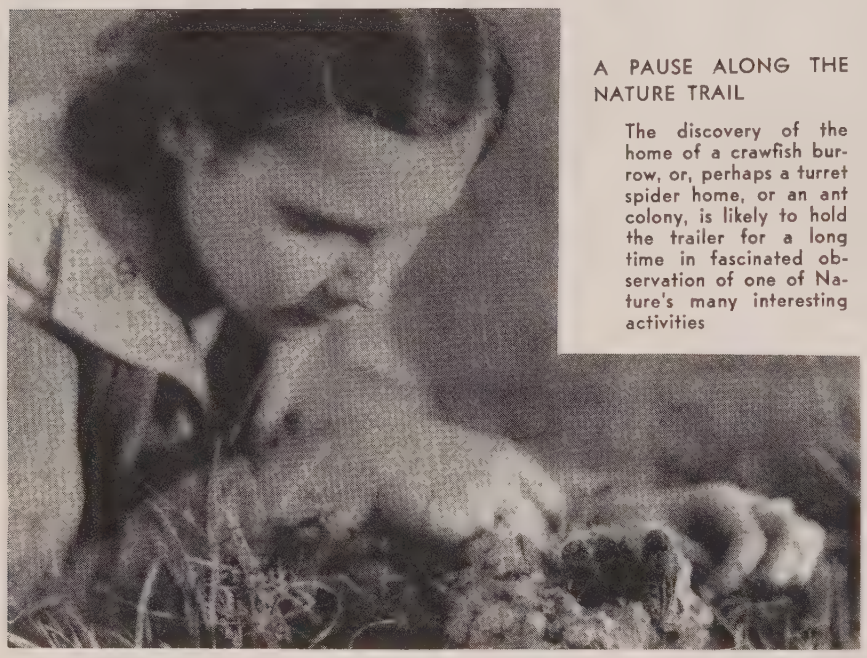
NATURE trails and games form part of the program of most summer camps and recreation groups, and some schools. Therefore it is not amiss to examine the methods used in planning and carrying out these trails and games so that they may be made more interesting and may better accomplish their intended purpose. Why do we have trails? Because they are a means of getting to a desired place whose exact location is unknown to most of the group. Why do we have Nature trails? To call attention to interesting things along the way, which might otherwise be missed.

What things must we keep in mind when laying such a trail? First, there must be the elements of *adventure and suspense.* Yet the trail must be *simple* enough so that it is possible for the group to follow it. It must be followed in *groups small enough* so that each member may take part and know what is going on. We must always keep in mind, "What's in a name?" Rather than merely telling the names of the various objects, it should *provoke thought* about them. It should point out interesting things well shown by the particular specimens passed. It could speak of their natural processes. It could point out different uses that man has made of them.

A trail should also always *lead to something.* It need not, necessarily, be a prize, but to another half of the group, a place to cook lunch, an interesting person who is to speak to them. We must remember that the trail is a means to an end, both in the physical and mental senses. It must "get somewhere" and it should provoke new interests.

The types of trails divide themselves into three classes: first, those for use on a short hike; secondly, those to make us better acquainted with a "permanent" environment, such as a campsite; lastly, permanent trails that may be used again and again by different groups of people.

An example of the first type of trail, for use on a short hike, is the familiar "baggage tag" trail. Squares of paper with crayoned borders, or ordinary baggage tags, are tied to unusual trees, flowers, rocks and such along the path to be taken. The tags themselves point out the way to be followed, and on them are written interesting facts about the objects tagged. One fact is about all that can be pointed out on one label. The groups follow this trail at five minute intervals. As each group comes in, an "examining board," made up of the three or four members who laid the trail, ask them a few true-false questions made up about the tagged objects. These usually refer to things not mentioned on the tags, and so check on observation and independent thought. For instance, one tag might have said, "You will see many red-winged blackbirds flying over this swamp." The first member of the examining board might ask, concerning this, "Did you see any female red-winged blackbirds? How are they different from the males?" Each group would be asked the same questions, and the second and third groups would be interested to see what the others learned along the trail. In answering, each group usually appoints a spokesman with whom they confer before giving their answer. The spokesman of the winning group may be crowned with a laurel wreath of grapevine leaves.



A PAUSE ALONG THE NATURE TRAIL

The discovery of the home of a crawfish burrow, or, perhaps a turret spider home, or an ant colony, is likely to hold the trailer for a long time in fascinated observation of one of Nature's many interesting activities

A somewhat similar trail, but useful especially in a city park or other place where there is danger of the tags being removed or destroyed before the trail is followed, is the "Make Your Own Decision Trail." Here there are no labelled or tagged specimens. In laying it, a few members of the group go along the route decided upon. They pick out various interesting objects and build the trail around them. As the trail is followed there is a decision to be made about the identity of each object or about some fact concerning it. Decided one way and you follow one set of directions; decided the other, and you go another way. Only the correct choice leads to the next object. For example, the trail starts beside a tree on which is posted a list of directions for the entire trail, one copy to be taken along with each group. The directions might read somewhat as follows: "This is a Black Oak. If you would use its wood for kindling, go fifteen paces due north. If you'd use it for fuel, go twelve paces northwest. You will be near a large black and white striped piece of stone. If it is a rock go north ten paces, but if it is a mineral go south fifteen paces, etc." The directions may be extended according to the length of the trail desired. If a mistake has been made, it will be discovered, because the next landmark will not be present. The group will then know, by the familiar process of "trial and error" the correct fact about the object.

Two slightly different types of trails are the "Initial Trail" and the "Totem Trail." In the former each follower is given a little manila paper booklet of one or two sheets, with his initials on the cover. As they walk along, under the charge of a leader who knows the way, they record in their notebooks all the objects beginning with their particular initials, or facts about the objects they pass the names of which begin with those initials. For instance, Mary Smith might record "Marble, metamorphism" (the process that makes marble from limestone), "sap" (possessed by a tree in the line of march), "sassafras." Each person who is going on the Totem Trail is asked to bring a piece of wood, preferably a black birch or a young oak limb with the bark on, and a knife. As they go along on the hike, each one who has seen five birds about which she knows or finds out some fact, can carve the Indian symbol for bird on her "totem pole." Each one who has discovered or knows a fact about five insects may carve the insect symbol, etc. The bark is left on the pole and the figures show because they are cut below the bark. Those who have filled in the majority of the symbols may add the good luck symbol. When the group has reached its destination, the symbols may be colored with crayons or water colors, while each member tells the one thing that she learned along the hike that was most interesting to her. The little totem poles are really very pretty and will be prized as mementos of the hike.

The second type of trail is that which helps one to become better acquainted with a "permanent" location, such as a unit at camp, or a Scout troop meeting-place. Nature books are provided, and various objects on the site are tagged with a number and a name, such as "Bertha Blueberry," "Wilhelmina White Oak," "Myrtle Milky Quartz," etc. When the members have become acquainted with each other, we announce that there are

some more "friends" that we would like to have them meet. Often they have played a game where they each took one other person in the group, found out all they could about him, and then introduced him to the group. We give each member a tag with a number and they go out to search for their new "friends," tagged with the corresponding number. They find out as much as they can from direct observation, and then come back to read their "biographies" and "diaries"—the Nature books. After half an hour or so, each one reports on her new friends, telling its interests, hobbies, appearance, life, and other details. Humorous and interesting accounts often result, showing keen observation and a growing interest in the new "friend."

The third type of Nature trail is the permanent type; that which is left set up, to be used by different groups of people again and again. In every type of trail we realize that the persons who lay the trail get as much benefit from it as do the persons who follow it. In this type of trail it is probably true that the persons who make it get the greater share of the interest and enjoyment. Therefore, we should give the chance of working on it to as many members of the group as possible. In order to keep up the interest in the project, it is well to intersperse manual labor such as clearing the trail with the mental activity of tagging it, completing short sections of the trail at a time. If the tags are pasted on heavy cardboard and covered in cellophane they will remain legible for a fairly long time.

We come now to the question of Nature games. You can usually adapt various games to Nature. A reading of a game book will show you that this is often done, for Nature games, signalling games, observation games, will all be built on the same plan. These games are more useful and more effective if you use them for a purpose. Games with bird cards are useful before one goes on a bird walk, especially if one includes birds that are likely to be seen. This probability inspires intelligent preparation for the coming adventure.

A well-loved game is "Nature Steps." All players but one stand in a long line facing the player who is "it." "It" says, "I am thinking of a bird whose name begins with B." Each player thinks silently of a bird whose name begins with that letter, and takes as many steps toward "It" as there are letters in the name of the bird. Any player who cannot think of a name will take as many steps toward "It" as there are letters in the word "nothing." When all have taken their places, "It" announces the name she thought of. All who were thinking of that bird may return to their home line. The rest wait until "It" calls "one, two, three," and then must try to get to their home line before being tagged by "It." Flowers, trees, insects, birds, mammals, fishes may be used. A variation is to ask questions similar to these: "I am thinking of a tree whose wood is useful for fuel." "I am thinking of a type of cloud that means rain."

We often find many games similar to "Leaf Matching." In using these games we must remember to keep the speed element out. We might start by giving each player a leaf, asking him to go out and bring back another like it, and tell the name of the tree to which it belongs. Books should be about for purposes of identification. After we hear the name of each tree, we ask them to go back to the tree again and see how they could recognize it with the leaves off in winter. Then they spend a bit of time with the books, finding out peculiarities of the tree, and checking with their trees to see if these are present, and learning the uses for its wood. Then a tour might be arranged for the next meeting when each showed off her tree to the other members of the group, pointing out things she found most interesting.

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New Zealand's Tui

By EDITH M. LAING

To the native Maoris, the god of forests is Tanemahuta, and his children are the trees, the birds, and all creatures that inhabit the woodland.

The child of Tane pictured on the accompanying one shilling stamp of New Zealand is the much loved tui peculiar to that country. Tui is the musical name bestowed upon it by the Polynesians, but to scientists it is known by the formidable title of *Prosthemadera novae-zealandae*.

The plumage of this blithe plunderer of floral honey-pots is shining black, interspersed by silvery streaks, and set off by iridescent greens and blues. At the angles of the wings are patches of white. At its throat it wears two snowy tufts, and encircling the rest of its neck, a collar of long, white, curving feathers that account for its popular name of the "parson bird".

Besides being a rare songster, the tui is an unsurpassed mimic, and has even been taught to talk. He can chuckle with mirth, cry like a baby, meow like a cat, and mock his fellow birds.

Among the silvery fronds of the fern-trees, the tui delights to pause and echo the clink-clonk-clonk of the bellbird's golden chime. High up among the festoons of crimson rata and fairy white clematis that mantle the fringe of the bush, he loves to dart up into the sunlight with joyous bursts of melody, and trill of the gladness of living.

His indeed is a gay spirit, charming all who dwell or wander in the bush-lands. Altogether, the tui demands attention by his beauty, voice and bearing.

DE CORVO SYLVATICO.

AVIS, cujus hîc effigies habetur, à noſtris nominatur vulgo Waldrapp/ id eſt corvus ſylvaticus, quo locis ſylvoſis, mõtanis & deſertis degere ſoleat: ubi in rupibus, aut turribus deſertis nidificat, quare etiam Steinrapp vocatur, & alibi (in Bavaria & Stiria) ein Clauſzrapp/ a petris ſeu rupibus, & pylis (nã *pylas*, i. anguſtias inter duos mõtes Germani Clauſen appellãt. hoc eſt loca clauſa) in quibus nidos ſtruit, Lotha

The Story of THE WALDRAPP

A curious bird, indeed, that one naturalist found in Switzerland only to be laughed down by his associates, who said he must have been seeing things

By WILLY LEY

FREELY TRANSLATED, OUR CAPTION READS:

The bird, the picture of which is printed here, is called, in our vernacular, Waldrapp, i.e., *Corvus sylvaticus* (wood crow), because it lives in secluded woods, mountains and nests in old towers and castles, which results also in (the name of) *Steinrapp* (stone-crow) and elsewhere, in Bavaria and Steinmark, they call it *Clauszrapp* from the narrow caves where it makes its nest. The German *Clausen* applies also to valleys between two mountains, which may be called *Loca clausa* (closed place).

THE RATHER adventurous and complicated story of the Waldrapp began about four hundred years ago; to be exact in 1555, A. D., in Zurich, Switzerland. In this year appeared—eagerly awaited by naturalists of the day—the third volume of a work that was to become the first comprehensive zoological textbook. Its author was Conrad Gesner, city physician of Zurich, professor of Greek, and later called the "Father of Zoology." The book, written in Latin, had the title *Historia Animalium.* Its first volume dealt with the animals that are called mammals nowadays, the second volume treated the other animals with legs, and the third volume was *"de avium natura"*—"on the nature of the birds."

The chapter on the Waldrapp is to be found on page 337, and is entitled De Corvo Sylvatico—On the Wood Crow—and contains a lengthy description of the bird. According to Gesner it was about as large as a hen, had a long red beak and long and slender red legs. Its feathers were coal black if seen from a distance, but showed a greenish hue upon closer inspection. There were a few long feathers on the back of its head but Gesner remarked that "he becomes bald headed in old age as I have seen." As to its diet, Gesner reported that "when I cut open this bird's stomach I found therein bugs, beetles and worms harmful to the roots of the crops." In addition to all this it was stated that the Waldrapp was a migratory bird and that its young were praised for having especially delicious meat.

Conrad Gesner is not the only author who mentions the Swiss wood crow. It is to be found in Ulysses Aldrovandi's *Ornithology* (1603), in Ray's contributions to Willughby's *Ornithology* (1678) and in Albin's *Natural History of the Birds.* While Aldrovandi uses the somewhat difficult name of *"Phalacrocorax ex Illyrio missus,"* Ray calls it "Gesner's Wood Crow", and Albin says "The Wood-Crow from Switzerland."

Of these three probably only Aldrovandi had ever seen the bird. Ray and Albin, it seems, relied on Gesner's authority for its existence. When in 1758 Sweden's Karl von Linné compiled his famous system he considered Gesner's report and Albin's picture (drawn after a specimen of the bird in Sir Thomas Lowther's collection) sufficient evidence to give a place in his system to the Waldrapp. Since Gesner had reported that it lived only in secluded places, Linné introduced *Upupa eremita* as its scientific name, *eremita* meaning "hermit." A few years later he changed his mind, for some reason, and restored Gesner's term *Corvus sylvaticus*—wood crow.

Linné's book was the last scientific textbook in which the wood crow found a place. Bechstein, greatest ornithological authority of his time, was the first to doubt the existence of the Waldrapp. His great *Natural History of Germany,* that appeared for the first time in 1791, mentioned the wood crow. The second edition of 1805, however, declared that Gesner had probably been fooled with a mutilated and altered stuffed specimen of some other crow. How Bechstein justified this opinion, after Gesner's statements that he had cut open the stomach of the Waldrapp and that he had observed that old specimens became bald headed, is hard to understand. The thought that the wood crow might have become extinct in the meantime did not occur to Bechstein, and his authoritative statement made all other authors omit the Waldrapp from their ornithological works.

Thus the bird became extinct in books as well as in Nature. But when things seem nicely and definitely settled something usually happens that necessitates a complete revision of all established opinions. In the case of

the Waldrapp, however, this "something" did not happen right away, and Bechstein's erroneous belief was allowed to prevail for a few decades.

Meanwhile another error occurred. Around the year 1833 the naturalist Wagler returned with a newly-discovered bird from Egypt. It was an ibis, and its scientific name became *Ibis comata* (now *Geronticus eremita*). When in 1880 Dresser published his voluminous English *History of the Birds of Europe* he included Wagler's *Ibis comata* by mistake. It did not belong in this book because it was not an European bird. But this error led—more than seventeen years later—to the rediscovery of Gesner's Waldrapp. Three ornithologists of world-wide reputation—Hartert, Kleinschmidt and Rothschild—compared, at a meeting in London, the pictures of the Waldrapp as printed in Gesner's work and in the first edition of Bechstein's book. One of the three had the feeling that these two pictures of the same bird reminded him of a picture he had seen in Dresser's work. Looking through the book they soon found the picture: it was Wagler's Egyptian ibis. They realized at once that the similarity of all three pictures was so striking that there was no doubt that it was the same bird. Then descriptions of the habits of the Egyptian ibis were compared with Gesner's chapter on the wood crow, and if there were any doubts left they were dispersed when it was found that in spite of the long distance between Africa and Switzerland the behavior of the birds was the same. It was concluded that *Ibis comata* had changed only one habit in the meantime, the habit of migrating to the North during the first few months of the year.

Thus Gesner's Wood Crow from Switzerland was finally rediscovered and Gesner was vindicated.

A number of years after this rediscovery another interesting find was made. Though its significance has been disputed, it is worth telling. There is a passage in the tenth volume of Pliny's *Natural History* that sounds as if it refers to the Waldrapp. Pliny repeats parts of an official report by Egnatius Calvinus, Roman governor of the Alps. Among other things, the distinguished governor remarked that frequently birds that resemble ibises have been noticed in the Alps. Pliny adds, with dignity, that an ibis does not belong in the Alps but to Africa.

It is possible that this report does not refer to the Waldrapp but to another bird of the Alps that might be mistaken for an ibis. Nevertheless, the Roman was right in that an ibis once lived north of the Alps, even if his particular observation was a mistake.

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Weeping Beech

By BYRD MOCK

This majestic tree, a living shrine of Nature lovers, marks a beauty spot of greater New York. It is under the protection of the New York City Department of Parks, and a house called The Weeping Beech House has been built near it for the caretaker of this famous tree, a variety of the European beech, and known botanically as *Fagus sylvatica pendula*. The spread of its graceful branches covers a circle eighty feet in diameter. It is, perhaps, the finest of its species in America. It is in Flushing, Long Island, near the World's Fair Grounds.

Rare weeping beech, bright emerald mosque,
A temple never made with hands,
Your soft green curtains outward sway,
Sweeping the velvet sward while bands
Of eager pilgrims press the earth
In reverence beneath your boughs,
And find asylum from despair,
And silently repeat new vows.

If tongues have ever dwelt in trees,
Ten thousand tongues dart forth in you
To tell to every passing breeze
Of beauty old yet ever new.
You've lived almost a century.
Men come from far and near to view
Your loveliness renewed each year,
And learn to worship God in you.

Wasting or Saving Our Soil

(Continued from page 86)

oppressive to the vision of man as it must be to those few cows that attempt to eke out on its sparse browse their lean and uncertain existence.

In addition to these major forms of erosion, our land is full of examples of other varieties less extensive in their coverage but equally portentous of future disaster. Upon large areas of our western mountainsides, which have been devastated by fire, heavy snows accumulated on unprotected slopes cause what might be called avalanche erosion, when their hold on the unstable mountainside is loosened by the rays of the spring sun.

Highway erosion can be seen wherever roads traverse the countryside. Cuts and fills invite erosion when hurriedly or carelessly made with slopes too steep to support vegetation. To highway engineers in the past drainage problems have been generally resolved by concentrating water into a small area, and discharging it from the neighborhood of the road as rapidly as possible. Such shortsighted methods often result in great scouring gullies forming from roadside ditches, which not only overflow and silt up farm lands below, but frequently work back into the roadbed itself, seriously to undermine or destroy the highway. Sometimes roadways themselves become ditches. The tracks of the covered wagons (and the great freight wagons that succeeded them) naturally followed the lowest and most level ground. There they easily developed into channels in which excess water collected and flowed. Trails turned into trenches and roads into gullies. In the Piedmont, to mention but one region, many farm roads have long been abandoned from highway erosion gnawing out their sides or their centers. With more than 3,000,000 miles of roads in the country today and with road improvement, by straightening the curves and leveling the hills and valleys, deepening the scars on the land, and, unless controlled, setting more erosion in motion, it is obvious that highway erosion is one of the really serious forms of the erosion menace.

Since orchards are frequently planted on steep slopes and since the steeper the unprotected incline the greater the soil wash, we find in our sloping fruit lands some serious examples of erosion. A similar type made worse by additional human interference is that induced by artificially applied water. On dry hillside orchards in California, for example, it is frequently the custom to irrigate directly down the slope from above through long ditches that utilize gravity as the agent for distributing the moisture. Soil loss under this treatment has run as high as an inch in twelve months. Profitable orchards on the best sloping land may thus be impoverished by the loss of their top soil in less than ten years.

Scientists have noticed that in some cases neither wind nor water is necessary to cause erosion. In Puerto Rico, for instance, gravity alone is occasionally sufficient to set the process in motion. The people of this mountainous isle, driven by a large and expanding population and by the use of the lower lands for large sugar plantations, have been forced to seek sustenance on mountainsides so steep as barely to permit of cultivation. Slopes as high as 36 degrees have been stripped of their tropical cover and planted to corn and tomatoes. The unprotected soil as it dries is barely able to cling to such precipitous declivities, and at times due to gravity alone one may see the soil simply slipping downward from a newly-cleared hillside.

Where snow, rain and wind have been ineffective in ruining the cleared countryside, man himself, impelled it would almost seem by a perverse desire for self-injury, has resorted to the arch destroyer, fire, to aid him in ravaging his own livelihood. In northern California, for instance, the Suisun marshes have long been building up a rich peaty soil in the area originally created by the silt, and occasionally overflowed by the waters, of the Sacramento River. This land has recently been "reclaimed" by a system of drainage canals and the peaty soil now yields a rich crop for the truck farmers who operate on it for the San Francisco market. These cultivators, however, have been accustomed to burn over their fields each spring under the mistaken impression that it improved the fertility of the soil. Actually this fire erosion simply burned away the peaty humus upon which the productivity of their crops depended. Several years of such burnings have now resulted in the loss of as much as eight inches of this rich and irreplaceable soil.

So much for the devastation. It is possible, however, to arrest soil loss, and the Federal Government four years ago, through the creation of the Soil Conservation Service, began to show what might be done to minimize this damage. At first, even with the aid of many data from erosion experiment stations scattered through the country, it was often necessary to adopt empirical methods. As the trials have succeeded, the errors have become fewer and a great body of information regarding effective methods of control is now being made available to farmers and ranchers. More than 150 demonstration projects widely distributed through the nation are endeavoring to illustrate in practice how erosion may be checked. On some of the older of these such as those at Temple, Texas, Anderson, South Carolina, and Pullman, Washington, to mention but three, the effects of soil and moisture conservation are really astonishing. By means of contour tillage, strip cropping, proper terracing and terrace outlets, with the aid of revegetation and gully control, through the planting of trees and shrubs, the building of small dams and the restoring to forest or pasture of steep land withdrawn from cultivation, a new stabilization of the soil has been achieved.

At Silver City, New Mexico, a man-induced gully of enormous dimensions once divided the city with a dangerous and growing chasm. Proper erosion control measures on the watershed above and stream-bank protection along the ditch itself have now harnessed this channel and

protected the town from the periodic depredations and inundations of Silver Creek. In the Panhandle of Texas desert areas of post-war origin are again being covered by a blanket of green. In the Coon Creek watershed near La Crosse, Wisconsin, erosion in the driftless area has been checked and up-stream waters now run clear of silt. Near Wadesboro, North Carolina, examples of the effectiveness of conservation measures have been disclosed by tests made of water runoff and soil loss from two drainage basins, one protected and one unprotected. From the unprotected Gould's Fork watershed, after a four-inch rainfall, soil loss per acre was six times what it was from the area drained by the protected Brown Creek, the waters of which, in contrast to the muddy flow from the former, ran practically clear. Three hundred and seventy-five CCC camps are also engaged in this work. Farmers or Nature lovers who are interested in practical erosion control should obtain from the Soil Conservation Service, Washington, D. C., or their state agricultural college, a list of these demonstration projects and camp areas and, visiting those near at hand, should examine in the field how effectively the soil can be saved.

Demonstrations, however, can only start the process. Actually to curb erosion throughout the country a broader, more direct approach is needed. State soil conservation districts will, it is hoped, prove the answer. Through enabling acts now passed by twenty-two states, provision is made for the creation of soil conservation districts that will have legal power, when set up and approved by the majority of the farmers in an area, to enforce proper land use regulations and, with the aid of technical assistance from the Federal Government, to prosecute actual erosion control operations. Those of us who are farmers may play an active part in soil conservation by aiding in establishing and properly organizing these districts. Those of us who are not farmers, but love our countryside as well as our country, should learn as much as possible of the problem and be prepared to spread education and to support Governmental and private activities that will effectively control erosion. Both may find out what they can best do by writing the Soil Conservation Service, Washington, D. C.

Although much has been accomplished much more remains to be done. The corner has not nearly been turned. Fifty million American acres have already been essentially ruined by erosion for further agricultural use, and another fifty million are in a condition almost as serious. Approximately 100,000,000 acres have been impoverished, and the process is well under way on an additional 100,000,000. About 200,000 more are being destroyed each year, and contributing their part to the $400,000,000 loss which soil erosion is annually costing the country.

Less than three percent of the eroded land in this country has yet been touched by proper soil conservation measures. While we write or read the rains and snow still descend upon bare fields and improper cultivation. Into the Mississippi still pour the silt-laden waters of a hundred eastern streams. The "Big Muddy" still carries through Missouri more and more of the fertile top soil blown or washed from the ten states of the high northern plains. Through the Grand Canyon of the Colorado River rush 400 tons of silt a minute, much of it from accelerated erosion on overgrazed western ranges, to pile up in the waters behind Boulder Dam deposits of over 6,000,000,000 cubic feet a year. In eastern Colorado and western Kansas the dunes of a new "Great American Desert" are increasing their depth and their depredations. No member of our nation can be careless of a loss that undermines the wealth of each, as the foundations of our prosperity are washing or blowing away. Only the most energetic application of funds and man-power can arrest this loss even within a generation.

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Dr. Grinnell Comments on Waterfowl

The waterfowl shooting season of 1937 is now a matter of history. Its effects on the waterfowl are as yet unknown. But it may be well to quote the following editorial as an indication of views of many persons, some of them hunters, on the subject of waterfowl protection. The passage is from the September-October number of *The Condor,* official organ of the Cooper Ornithological Club, and is signed by Dr. Joseph Grinnell, well-known naturalist, and its editor. We quote:

The postcard vote called for in our last issue (p. 180) on the question of completely closing the season on waterfowl (ducks and geese), versus continuance of an annual open season, met with sufficient response, we think, to be fairly significant. The vote was 23 to 1 for a closed season of at least two years' duration; some were for a much longer closed period. Only one vote was received from any person vocationally identified with a state or federal agency engaged in game administration, although several voters are, or have been, hunters. This was thus an expression of judgment by free-lance naturalists; and for the most part these are field observers in the West. Speaking, now, for the one person whose initials are appended, the declaration of a prolonged closed season seems the only practicable method in sight of saving the rarer species from extinction—from joining the limbo of the Labrador duck. It is believed that the present factor of shooting is the dominant one against the ducks; but if reduced nesting ground be the most important adverse factor, then, say, a 3-year respite from gunning would prove the point: Marked increase then would justify throwing the season open again. We as naturalists are doubtless "sentimental" in this matter: we abhor the wiping out of any species —the lopping off of the results of age-long evolutionary process. To many hunters, no doubt, mallards and pintails are the "best" ducks anyway, and as long as these can be fostered through "management" of breeding grounds and can hold up under the annual shooting, all is rosy. But the naturalist equally desires the continued existence of the canvasback, redhead, spoonbill, ringneck, ruddy, and the rest. These other less tolerant ducks, we hold, could all suffer extermination and still there might be "ducks unlimited" from the sportsman's viewpoint. We want to insure continuing existence of all our species of waterfowl. Again this fall there will be slaughter of ducks and without discrimination of species on the part of many shooters; this was decided in places of authority long ago. But another year will come, and everyone Nature-minded should study the problem and then publicly stand by the conclusions he reaches; we yearn for real waterfowl protection before any species is actually gone.—J. G.

"Never too Late to Learn"

By NORMAN EDSON

I HAD BEEN photographing birds for years when one day, standing on the top rung of a step-ladder, straining my neck to peer down into a thrush nest, I did not see the freckle-faced farmer's lad standing near, until he asked: "Say, Mister, why don't yuh git a periscope?

I turned my head and looked down—the freckle-face was serious.

"A periscope?"

"Yeah-sure, one like my Dad used in the trenches when he wanted to look over the top without gittin' his head blowed off."

Slowly—I came down from the ladder; gave the boy a dime, and sat down to think.

Result: a fifteen-cent mirror from the corner store, and a four-foot cardboard tube from the inside of a roll of oilcloth. The mirror—five inches wide and circular—swung on two wire supports which were fastened with string to the end of the tube. The combination, tube and rod, reached easily sixteen feet into the air, permitting the mirror to reflect to me the bottom of the deepest nest.

I tried it next day while rambling through the country by-ways. I could spy into any nest that was not higher than fifteen or sixteen feet from the ground, and tell if there was anybody at home, or if it was just a relic.

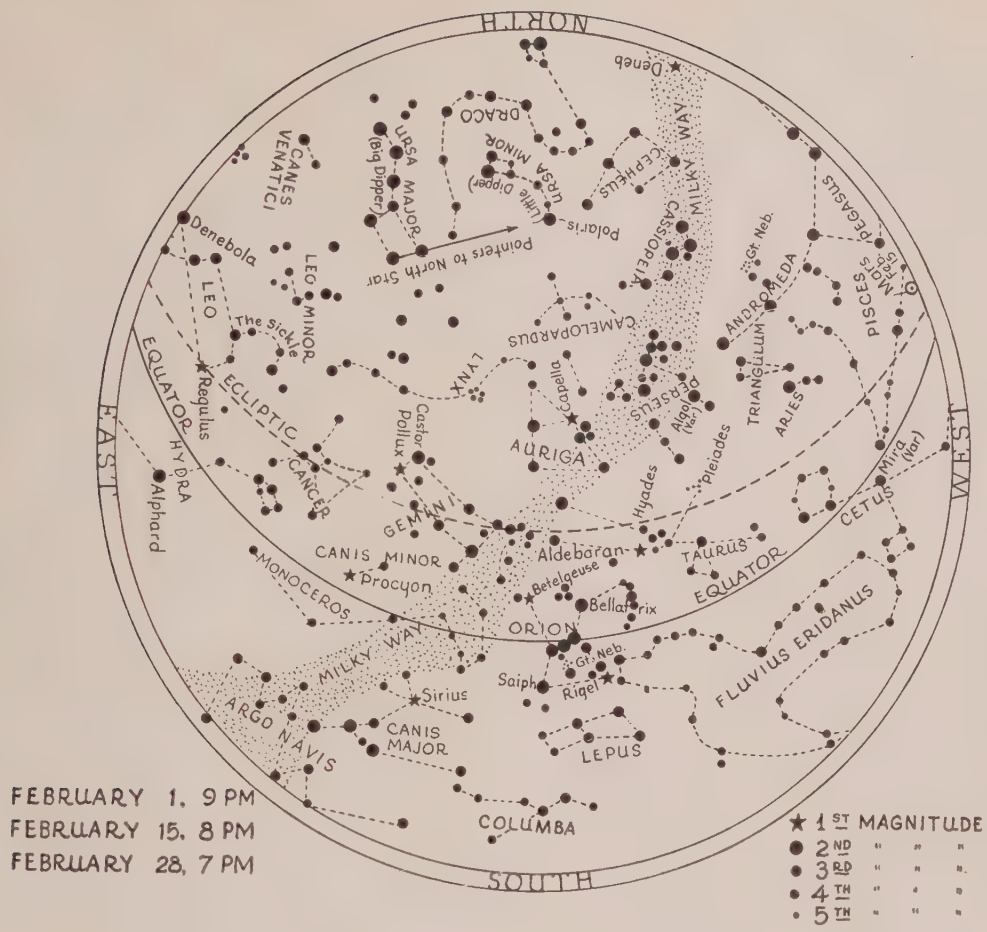
NO, THIS PICTURE IS NOT UPSIDE DOWN

Merely an ingenious way of photographing and observing a nest otherwise in an awkward spot. At the left the periscope spies on the hummingbirds

It was in photographing the eggs, or little ones, that the farmer lad's idea worked best of all. I tried it out on the first hummingbird's nest I found. Mrs. Hummer had chosen the prickly bough of a crimson rambler in which to build her home. The nest was six feet from the ground. Into the earth directly below I drove my pole, and to this spliced the cardboard tube so that the mirror, slanting slightly across the nest, reflected the two little hummers inside into the lens of my camera.

You will see another use for the mirror in the picture of the phoebe's nest. This phoebe was a sociable soul and built her nest on the top of a post in a corner of my woodshed. The roof, slanting only four inches above, made it impossible to look inside and see how the old lady kept house, but by fastening the mirror by two screw-hooks to the rafter at the side, she had no secrets from me. For light to make the picture a beam of sunlight was shot in through the door from a large mirror outside held in the arms of my daughter. It was so bright the exposure required but a fraction of a second.

The mirror cost so little I could afford to leave it, and later watch the going's-on in the phoebe home. At first Mrs. Phoebe made quite a fuss about having such modern conveniences. However, it did not take her long to get used to it, and no doubt she found entertainment in primping herself before its silvered surface.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Splendors of the Winter Sky

By ISABEL M. LEWIS

THE constellations that appear in our northern heavens during the winter evenings are remarkable for their great brilliance. At no other time of year may we count so many stars of first and second magnitude above the horizon at the same time or see so many objects of exceptional beauty and interest.

Orion, generally conceded to be the most magnificent constellation of all, is now seen at its best, due south, at nine o'clock in the evening the first of February. Two of the Orion stars, Betelgeuse and Rigel, are among the twenty brightest stars. Five, the three stars in The Belt, and Bellatrix and Saiph, diagonally opposite each other in the huge quadrilateral of stars that outlines the form of the great warrior, are of the second magnitude, and there are four of the third magnitude. Below the Belt in the Sword of Orion is the most remarkable object in the heavens, The Great Orion Nebula. Although a powerful telescope is needed to show this enormous, gaseous nebula in all its beauty, it is a fine object even in a small telescope and may be seen as a hazy patch of light without optical aid. In the heart of the Great Nebula is the sextuple star known as Theta Orionis. Four of the stars, forming what is known as the "trapezium," are easily visible in small telescopes, while the other two are occasionally glimpsed even with a three-inch telescope. Orion abounds in double and multiple stars. Rigel, or Beta Orionis, is a most remarkable star. Intrinsically it is one of the most brilliant stars in the heavens, a super-giant with a luminosity equal to nearly 18,000 suns as bright as our own. It is so distant, however, that it takes over 540 years for its light to reach us, and is, therefore, because of its great distance, apparently inferior to Sirius, most brilliant of all the stars.

Rigel is also a multiple star in which a faint pair of stars revolves around the principal star and two companions. Rigel is a brilliant bluish-white in contrast to the giant red variable star Betelgeuse, or Alpha Orionis, which is diagonally opposite to it in the quadrilateral of stars. Betelgeuse is not a member of the great Orion group of stars, which is a physically connected group at the same order of distance as the Great Orion Nebula, or between five and six hundred light-years distant from the earth Light from Betelgeuse takes about 270 years to reach the earth and as the star varies irregularly in brightness its luminosity, compared to that of the sun, also varies from 5,500 to 2,000 times the solar brightness.

In addition to these two brilliant stars in Orion, six stars of first magnitude, or brighter, are visible in the evening sky in February, as are about thirty stars of second magnitude. The two Dog-Stars, Sirius in Canis Major, The Greater Dog, and Procyon in Canis Minor, The Lesser Dog, following on the heels of Orion, are close stellar neighbors of the earth. Sirius is one of the white "hydrogen" stars, so named because hydrogen exists in such abundance in the atmospheres of these stars. Its distance from the earth is nearly nine light-years and it would take twenty-seven suns as bright as our own to equal it in brightness. Procyon is also a close neighbor of the solar system at a distance of eleven light-years, and it would require seven suns as bright as our sun to equal it in the amount of light that it gives forth. Both Sirius and Procyon are attended by companion stars.

Capella, in Auriga, is a giant star about 140 times more brilliant than our own sun and at a distance from it of about forty-six light-years. It is a yellow star of the same type as the sun and one of the most beautiful stars now visible in the evening sky. It has an attendant star that can be seen only in the most powerful telescopes.

Auriga lies north of Orion, separated from it by the horns of Taurus, the Bull, whose tips are marked by the two brilliant stars, Beta Tauri and Zeta Tauri. The former, the farther north of the two stars, is a fine example of a white star. It is a star of the second magnitude and forms, with the brightest stars in Auriga, a fine pentagon which is one of the most conspicuous configurations in the winter sky. Capella may be easily identified by its neighboring group of The Kids, a few degrees to the southwest, consisting of two stars of the third and one of the fourth magnitude. Auriga is supposed to represent a Charioteer holding in his arms The She-Goat, Capella, and her three small Kids.

Taurus is one of the most famous of the winter constellations, chiefly because of its two conspicuous clusters, the V-shaped group of The Hyades, which contains the brilliant, red, first magnitude star Aldebaran at a distance of forty-five light-years from the earth, and The Pleiades, one of the most beautiful groups of stars in the heavens. Five or six of the brightest stars in The Pleiades, including the third magnitude star Alcyone, the brightest of them all, form a small dipper that is easily identified on a clear night. It has been said that as many as fourteen or sixteen of the stars in this cluster have been seen under exceptionally fine conditions by persons with unusually keen sight, but most of us cannot see more than six. With a good field glass, or small telescope and low power eyepiece, this cluster is a beautiful object, scores of fainter stars in the group coming into view. The brightest stars in the cluster are embedded in nebulosity which is illuminated by their reflected light. Many beautiful photographs showing this nebulosity and the stars involved in it have been taken with the aid of powerful telescopes. No one should fail to observe this beautiful group either with binoculars or a small telescope.

Gemini, another of our finest constellations, is visible during the winter months and far into the spring. It is distinguished easily by its two brilliant stars, Castor and Pollux, The Twins. Pollux, the brighter of the two stars and the one farther south, is one of the twenty brightest stars. It is yellowish in color and its distance from the earth is 33 light-years. Castor appears in the telescope as a fine double star and there is a third faint companion star, the three forming a triple star system. Castor is distant from the earth about forty-five light-years.

To add to the beauty of the evening skies at this time of year we have in the northwest the fine constellation of Perseus with its noted variable star Algol, and its magnificent star clusters visible with small telescopes. Nearby also are the three brilliant stars in Andromeda and the familiar W of Cassiopeia. In the northeast, on the opposite side of the pole from Cassiopeia, is the Big Dipper, and The Sickle in Leo is now appearing in the east. Regulus is the eighth of the brightest stars which are now in view in the evening. It is also one of our nearer neighbors among the stars and has a companion star that is itself made up of two close stars. Its distance from the earth is about sixty-four light-years and it is nearly one hundred times brighter than our own sun.

In the evening sky this month Mars and Saturn may both be seen in the southwest in the early evening in the constellation of Pisces. They will both remain in this constellation throughout the month and will be in conjunction on the second of February when Mars will be due north of Saturn. The two planets are almost exactly equal in brightness the first of the month, but Mars is receding from the earth and will decrease in brightness during the month. It can be easily distinguished from Saturn by its reddish color. Venus is in superior conjunction with the sun on February third when it passes to the evening sky. Mercury is too close to the sun to be seen this month. Jupiter is now in the morning sky but will not be visible until near the end of the month.

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The Book of Wild Pets

Clifford B. Moore, zoologist of the Museum of Natural History in Springfield, Massachusetts, has written an excellent text with the above title that should prove of great value to teachers, museum workers, parents or anyone interested in wild creatures as pets. Although first glance at the title might give rise to the assumption that the volume was concerned only with small mammals that are suitable for domestication, the first chapter, explaining how to set up a balanced aquarium, is only the beginning of a thoroughly informative and interesting book that instructs the reader in the care of nearly everything from canaries to copperheads. Profusely illustrated with 214 photographs and 128 line cuts, *The Book of Wild Pets* is available from G. P. Putnam's Sons, New York, for five dollars.

Among Our Authors

Karl Maslowski (Birds of an Earthquake Lake) is a busy young man. He works for the Chatfield Paper Corporation, attends evening classes at the University of Cincinnati, conducts a Nature column in the Sunday Cincinnati Enquirer, and "chases" animals, especially birds, with a camera when he can. "Most of my spare time during the past three years," he says, "has been devoted to photographing animals in their natural habitats. I have used the resulting pictures, both movies and stills, in roto sections, articles and lectures in an effort to bring about a better understanding between man and his 'wild relatives'. My travels after birds have taken me from the Gaspé Peninsula to South Carolina and westward to the Mississippi. My best pictures have been made not in these far places, but, rather, within twenty miles of Cincinnati."

Marie Gaudette and Lou Williams (Nature Trails and Games) have a common interest in camp Nature work. Miss Gaudette directs Girl Scout Nature work, after having run a florist shop in Providence, Rhode Island; worked at the Providence Natural History Museum; directed a Girl Scout camp in our littlest State. She gives training courses for Girl Scout Camp Nature counsellors and troop leaders, and writes on Nature subjects. Miss Williams is a Fellow in Geology at the University of Chicago, chiefly interested in sedimentation and paleobotany. She is a resident of Illinois and camp Nature work is her hobby.

We Blush With Shame

In our January issue, on Page 31, Stephen Haweis writes: "Abel died for his curious ambition to grow a few vegetables, while his brother sat on the hillside and watched his sheep, assisted, no doubt, by a dog." Both because Mr. Haweis is a minister's son, and because we got it in our mind that Cain developed homicidal tendencies because of too much time on his hands, we did not check this statement with our usual care. Now the first of probably a legion of readers calls our attention to the Book of Genesis, Chapter 4, Verse 2, which (and we quote with profound apologies) reads: "And Abel was a keeper of sheep, but Cain was a tiller of the ground."

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"I have sold, up to date, nineteen features to the Detroit Free Press and have been made their correspondent here," writes Mrs. Leonard Sanders of 218 Union St., Milford, Mich., on completing the N.I.A. course. Her skilful handling of feature stories was the reason given by the editor for her appointment. Mrs. Sanders' first feature was sold less than four months after she enrolled with N.I.A.

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THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER
Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

FOOD FOR THOUGHT AND THOUGHTS ABOUT FOOD

In last month's *Nature Magazine,* this page was given over to suggestions for school studies dealing with how things get about over the world and how they vary in different parts of the world. This month, suggestions are made for learning how they differ in their food needs and how nature students may develop hobbies in connection with these problems.

Last month it was suggested, among other things, that stamp collectors might look for stamps with pictures of different forms of wildlife on them. Within a week from the time it was written, a stamp collecting enthusiast came over to show me a big book with the stamps arranged according to the regular classifications of the animals. There were pages of cat stamps, of dog stamps, beautiful ones of some Australian animals and other representatives of most parts of the world. I almost became a stamp collector myself after seeing that collection.

But the food problem is one that is on us now, and in most parts of the country it will be a big problem to wildlife at about the time this number of the magazine is out. How can it be studied to advantage with the help of this and of recent numbers of *Nature Magazine?*

According to the dictionary, in food is included anything that enters into the composition of a consuming organism. This therefore includes air, water and solid foods. As a starter, then, look through recent numbers of this magazine for pictures of creatures modified to get air, water or solid food under trying conditions.

Interesting discussions on the place of air intakes may be found for alligators in Volume XXX page 329, and for frogs on XXX, 367. Why are not the nostrils of a deer placed as they are in the alligator and frog? Look for the location of nostrils in the turkey shown in XXX, 202; the fox, XXX, 200, and the marsh hawk, XXX, 154. Why are they where they are? And then for fear that you may think that nostrils are used only for breathing air look for the nostril on the shark—XXX, 283—which lives under water and would use the nostril for something other than taking in air. While working on water animals, then look over pictures of the piranha, XXX, 282; the bowfin, XXX, 161; and others, to see the location of their gill passages through which the oxygen-loaded water passes while they breathe. Then go back to the shark picture, XXX, 283, and notice how its breathing openings on the side of the head differ from those of the other fishes.

But air problems should not take all of our time. Look over the pictures of the birds to compare the types of bills that are suitable for getting different kinds of food. Why, for example, do you suppose the skimmer, XXX, 214, has that long lower bill while the herons, XXX, 366, have the long pointed bill? Why do both the hawks and the owls, XXX, 220 to 224, have those similarly shaped hooked bills? There are reasons for all of these things that can be learned by thought by school children. After these are learned they can be checked and applied by looking through other numbers of *Nature Magazine,* and *Nature on Parade,* which has brought the best of all of these pictures together in a single volume.

It is not convenient in most pictures to notice characteristic teeth possessed by types of mammals with different food habits, but it is worth looking for anyway. The gnawing teeth of the rodents and the effective flesh-cutters of the dogs and cats often appear in pictures. Look for them. The claws of some of the animals and other parts are frequently modified conspicuously for food getting as may be seen with the mole, XXX, 354; the bear, XXX, 41; the praying mantis, XXX, 96, and others. The long devices used by many molluscs for getting food-bearing water down to depths where the shells are hidden is well shown with the angel-wing, XXX, 350. The way crabs carry and catch food is suggested on XXX, 226 and 227.

Many people have not the slightest idea what is the food of representatives of the commoner groups. Here is a good chance to find out. Look for the robber fly and egrets in this number. Then look over the food needs of millipedes and centipedes, XXX, 355; flying squirrels, XXX, 296; blue jays, XXX, 349; young goldfish, XXX, 300, and others. Make charts to include lists of those which eat carrion, XXX, 111; those which eat insects, XXX, 354 and 194; those which are accused of eating birds but may not be so bad as painted, XXXI, 40; those which eat forage, XXX, 136; those which eat nuts, XXX, 296; those which eat grain, XXX, 9 and so on. Any of these suggestions could be worked up into a good section of a Nature notebook.

As the work on food problems becomes more suitable for the upper grades it may include studies of the seasonal variations which are necessary due to change in weather over an area and the necessity for migration which this causes, as with the elk, XXX, 293. It should include the seasonal storage of foods which do not easily perish, as with some of the rodents, XXX, 271, and recognition of the fact that some of these do not store their food except in the form of fat, as shown in the reference just quoted.

Age variations associated with food needs are well brought out in the story of the early stages of goldfish as developed in this number; as shown in the great developments which take place with no food being taken in as with some of the moths, XXX, 273, and with the manner in which not a few plants lay up a food supply and thus are able to live through bad times, XXXI, 11. Provision which one generation makes to assure an adequate food supply for the next is brought out with the tumble bug, XXX, 204; the digger wasps in this number, and with the many pictures shown of young being cared for by the older generation. Rather unique in this connection is the picture of a mother cat caring for and nursing young opossums, XXX, 226. The question whether this is due to maternal instinct on the part of the cat, or relief from accumulated secretions of milk, need not here be gone into. It might be well while this study of maternal protection is being considered to make a study of the number of photographs which appear of wild birds with young, or on or near nests. Of course the actual number with young or near nests will be larger than is obvious since these will not show in the pictures but it is true that some of the best pictures are made of wary wildlife when, for the sake of the next generation, the forms photographed temporarily forget fear for their own safety. The race must go on.

And while we are speaking of pictures of wildlife it might be well to compare the pictures of wildlife in *Nature Magazine* with those of other magazines supposedly serving the same field. I took the trouble to look through corresponding numbers of a similar magazine and found that while *Nature Magazine* showed cuts from photographs of more than 200 living free wild things its competitor showed just three, and indications were that one of these was shot shortly afterwards. *Nature Magazine* showed not a single picture of an animal that had been shot or been made into a museum specimen, while the other showed over 200 of this sort of thing. Surely it would seem that in this magazine of ours teachers and children can get the next best thing to real first-hand experience with wildlife.

But to get back to these food problems. There are many others left to be solved. Among these might be study of those animals whose food habits directly compete with man's interests. Conspicuous among these in some parts of the world might be the piranha, XXX, 282, which eats man himself; the termite, which wrecks his houses and furniture, XXX, 158, and possibly some of the birds that feed on grain which he needs, as in the rice fields, XXX, 9.

Another study might center around the problems of food which have to be met by wildlife in times of flood, XXX, 49, and similar tragedies, but most important of all is recognition of the fact that many forms of wildlife that might supply man with food have been greatly reduced in numbers or wiped out of existence, as in the case of the prairie chicken slaughter, XXX, 342.

For those who are philosophically inclined or are interested in species whose relations to the food problem are not clearly understood, it is recommended that there be read, "Who Knows", XXX, 283; the review of a bulletin on crows, XXXI, 50; the story of a goshawk, XXX, 38-40, and the story of Reelfoot Lake told in this number. If that is not enough, the Conservation section of any number will provide many suggestions.

As was the case with the article on this page last month, further enrichment of this subject through reference to older numbers of *Nature Magazine* may be found in *Nature Magazine's Guide to Science Teaching.* There, on page 10, are given suggestions for developing the idea on a cumulative basis through the first nine grades.

Next month this page will deal with the use of *Nature Magazine* in developing some ideas in connection with the study of sound, weight, and some other topics normally treated in the field of physical science.

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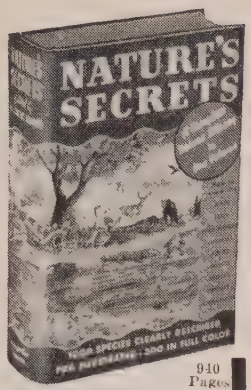

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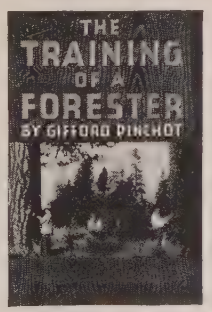

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Booklet number one of the Plant Culture League, a non-profit organization of amateurs interested in the study of plant life, is entitled *Scientific Tank Farming,* and discusses the technique of this interesting phase of gardening. Those interested in growing their vegetables in the winter, indoors, in nutrient solutions, should have a copy of this pamphlet. It is available from the League at P. O. Box 1111, San Pedro, California, for fifty cents.

New Garden Head

Dr. William J. Robbins, professor of Botany and dean of the Graduate School of the University of Missouri, has been selected as the new Director of the New York Botanical Garden, it has been announced. Dr. Robbins has won a reputation as a plant physiologist as well as an executive during a career that has taken him into many American research and educational institutions and into the laboratories of many European countries. He succeeds Dr. Marshall A. Howe, deceased, as the fourth director of the Garden.

The Koala Magazine

A new conservation publication, The Koala Magazine, makes its bow with the October issue, to be published quarterly by the Koala Club of Australia. Good wishes and success to this new venture. We hope it will be influential in convincing the people of the Island Continent that native wildlife, particularly when it includes so many species found nowhere else in the world, is more valuable alive than dead.

Leaf Key

A leaf key to Florida's broad-leaved trees, except palms, has been published by Mary Franklin Barrett, formerly of the State Normal School and the State Teachers' College, Montclair, New Jersey. Completely illustrated by E. Bradley Tuttle, this pamphlet is available for one dollar from Miss Barrett at 57 Union Street, Montclair.

Messages of Peace

A tiny book with a large amount of interesting and valuable philosophy well describes *Nature's Messages of Peace.* It was written by Sam Campbell, Nature lover of the first rank, well known as "The Philosopher of the Forest" and as a radio lecturer. The volume is a collection of the most popular of these talks broadcast on the Sanctuary Hour, and includes Wilderness Symphony, The Antlered King, A River is Born, Rain, and many others. The book is available from Associated Authors, 222 West Adams Street, Chicago, for $1.50 plus five cents to cover postage.

Watching Wild Life

A book for those who enjoy a tramp in the country and the open air is *Watching Wild Life,* by Phyllis Bond. With this volume, published by Longmans-Green and Company, New York, the outdoor lover interested in the English countryside will be able to identify the songs of birds, recognize animal footprints or become adept in tracking small mammals to their lair. The book is available from the publishers for $2.40.

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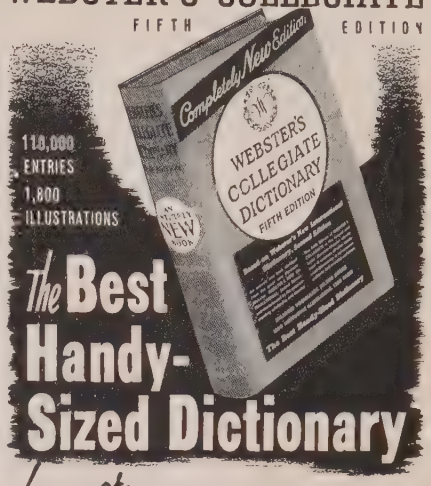

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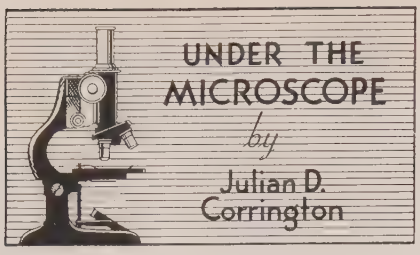


Textiles

A logical sequel to December's article on paper is the study of textiles, as these are also composed of fibers, the majority of which are of plant origin. Second only to agriculture in age and number of persons employed, the textile industry has taken high rank throughout the ages and continues of immense importance in our day, when machine methods have supplanted handicraft all along the line.

Textile microscopy forms one of the major divisions of our science. Owing to the keen competition between nations, as represented by their leading manufacturers, every mill of importance that produces either threads, yarns or fabrics employs one or more research microscopists to check on purity and quality of products and to experiment with new materials, processes and methods. This field hence offers one of the best and most numerous opportunities to those wishing to take up the microscope professionally.

What does one do in becoming initiated into the mysteries of this science? Granted some knowledge of the microscope and its use, the first step is to learn to recognize different fibers under magnification. And for this purpose we will first of all need to collect a set of specimens.

Fibers can be stalked in the field during summer months, but one would have to be a globe-trotter to do so, and would also need to know fibers in advance in order to recognize them. Hence we will make our field trip to the yard goods counters of a department store and request small samples such as are customarily given to prospective buyers. Each should be definitely identified by an informed clerk as to material and promptly labeled by the collector.

Here we will obtain the world's offerings within a few minutes: cotton from our own South, linen from France, silk from China, wool from England, hemp from Russia, jute from India. Also, we must secure a small piece of mixed goods, as cotton and wool or cotton and silk, and several different kinds of rayon, such as viscose, cupra, nitro and acetate.

In your own work room, take a pair of coarse needles and begin to fray one edge of each sample piece of *fabric,* removing five or six horizontal strands so as to expose some one-quarter inch of the vertical row. This will reveal separate *strands* which may be of one or more individual *threads*. Next fray out the ends of one or two strands, disclosing separate *fibers*. Trim the rest of the piece to fit under a cover glass, soak in xylene for ten or fifteen minutes, then mount in one or two drops of medium-thin balsam. Clean and label when dry. Such a mount shows fabric, threads and fibers, all on one slide.

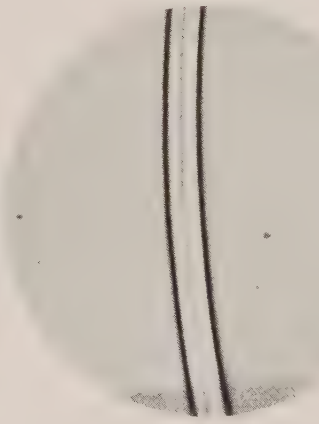
Fibers are classified as to source and are animal, vegetable or mineral in origin. The leaders among animal fibers are wool (hair) and silk (hardened liquid secretion), while cotton (seed hair) is far and away the most valuable contribution from the vegetable kingdom, as asbestos is for minerals. Minor animal fibers include mohair (angora), horsehair and camel hair; other vegetable items are flax (linen), hemp, Manila hemp, sisal, jute and ramie; additional mineral offerings are glass wool and slag wool.

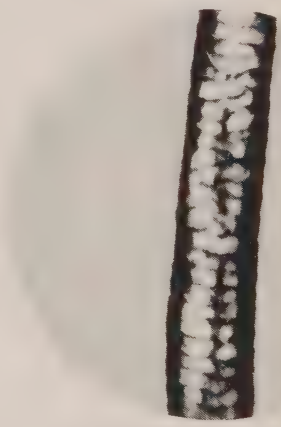
Recent years have witnessed the rise of a huge new textile group in the synthetic production of the various rayons, made from the cellulose of woody plants, liquefied and forced though small holes in metal plates. The product is literally "wooden silk."

Each of these and other fibers presents a characteristic appearance under the microscope, not too difficult to learn. Thus wool, being an animal hair, shows a surface covering of fine cuticular scales; cotton fibers are flattened and twisted; rayon is tubular and perfectly smooth. A knowledge of botany is helpful, especially in connection with the structure, types and markings of woody and bast fibers as applied to commercial plants.

Following fiber study, one should inspect fabrics and observe the various patterns of weaving under low magnification. *Plain* weave is that in which a regular succession of wefts pass alternately under and over an equal series of warps. The cotton miller terms this weave "factory." But there are a great many variations of this simple theme, as in *twill,* where wefts pass under two or more warps at a time. *Satin,* made of silk, and *sateen,* of cotton, are woven by this principle. *Damask* is a complicated material of this sort, while in *brocade,* wefts are skipped instead of warps. In *gauze* the warp threads are twisted around each other after each passage of the shuttle bearing the weft thread, locking the threads at the crossings, as in a fish net.

By using threads of varying thickness a corded effect is produced, as in *repp;* felting loosely woven and soft yarns gives *broadcloth;* weaving hard-twisted threads results in shrinking and puckering upon removal from the loom, making *crêpe.* Using two warps, one of which stands above the surface in a series of loops, gives *terry* cloth or *Brussels* carpets; if the loops are then cut, the result is *velvet* fabric or *Wilton* carpets. Variations are well nigh endless, but enough have been listed to show how fascinating the subject may become.





LOOKING THROUGH THE MICROSCOPE WE SEE, FIRST, A STRAND OF RAW SILK FROM A PIECE OF CLOTH JUST COME FROM THE LOOM. THE TWO DARK LINES ARE THE RESULT OF POLARIZED LIGHT ON THE TWO STRANDS THAT MAKE A "SINGLE" STRAND OF SILK TAKEN FROM THE COCOON. NEXT WE SEE A STRAND OF VISCOSE RAYON. NEXT IS A STRAND OF DRY WOOL LAID IN DISTILLED WATER SO THAT IT COMES PART WAY UP THE SIDES OF THE HAIR. THIS IS DONE IN ORDER TO MINIMIZE THE HEAVY BLACK EDGES WHICH OTHERWISE OBSCURE ALL BUT A NARROW STRIP ALONG THE TOP. BELOW IS A STRAND OF COTTON. THE TWIST IS AN IMPORTANT INDEX OF QUALITY.

The microscope may be employed further to spot diseased or inferior fibers, as shoddy or kempy wool, or unripe cotton; to detect adulterants or substitutions, as when rayon or mercerized cotton masquerades as real silk, or mixtures of cotton and wool are supposed to be "all wool and a yard wide;" to study dye penetration and see whether first class or inferior dyes have been employed; or to observe the finishing materials and processes.

Among this last class come the use of starch to add stiffness and weight; clay for solid finish; glossy texture imparted by an-

monia water with gums and mucilage; or softness by treatment with glycerin, oils and fats.

Distinctions are to be made between dyed and printed goods, especially among the cottons. Then one should not neglect the coarser stuffs, as canvas, cordage, burlap and the like, and the fireproofing materials employing asbestos. Of what fibers is a felt hat composed and how made? What are oakum and tow and for what purposes used? These are but examples of numerous questions that will arise as you delve into work with textiles and which will provide many an entertaining hour of a winter evening among the volumes of the encyclopedia.

* * *

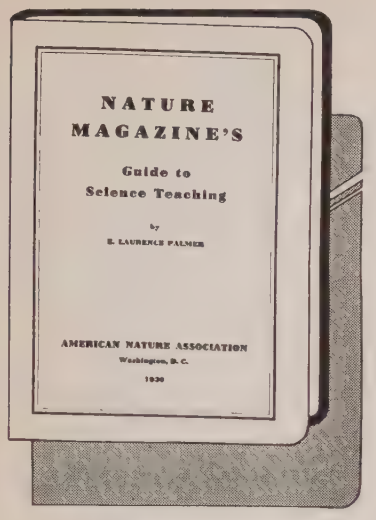
Beginner's Primer

Preceding articles in this department have referred casually to such reagents as balsam, alcohol and xylol, and there will be many others to take up from time to time. As one advances in microscopy, however, it is not sufficient to know these substances merely by name; rather it becomes increasingly important to learn something about their sources, composition, properties and uses, with the particular aim of understanding the reasons back of such usage. Topics of this nature will form a regular feature of these columns and should prove interesting to beginner and advanced student alike, since many of the latter may have by chance missed this information during their experience.

The ending makes a good beginning in this case, so let us describe the material last to be used in slide technique—balsam. The term is a general one and refers to any of several aromatic and resinous plant products, some of which are valuable in medicine. Canada balsam is the specific substance employed in microscopy and is a turpentine derived from the tree of the same name. It is also called the Balsam Fir, Fir Balsam, Fir Pine and Balm of Gilead, *Abies balsamea,* native to Canada and the northern United States.

The bark of this fir is smooth but is covered with numerous vesicles containing the exuding resin, and the balsam of commerce is collected by breaking these as well as by incision of the bark. The substance thus obtained is a clear, light-yellow, viscous resin, liquid when first produced but gradually hardening to a transparent solid upon exposure to air and the consequent evaporation of lighter ingredients.

As collected, this material is known as natural balsam and is often used for slide mounting in this form. More commonly it is evaporated to a solid, then dissolved in xylol and marketed as xylol balsam. During such preparation it is customarily filtered through paper, and the term "paper filtered" in supply house catalogues indicates such treatment. Finally, as to terminology, most balsam is slightly acid in reaction, often an undesirable feature in microscopy. When this acidity is corrected, the product is advertised as neutral balsam. The individual, by merely adding a pinch of pure sodium carbonate to the contents of a small bottle of balsam, or by keeping two or three pieces of marble in the bottom of the container, can neutralize his own balsam. Every user of balsam should provide himself with a regulation balsam bottle, which is low and squat to prevent overturning, and has a glass cap and



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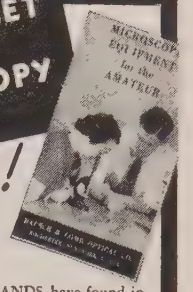

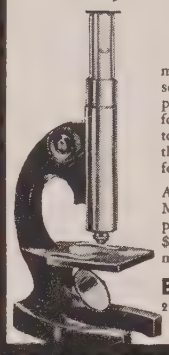

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glass rod applicator to spread the balsam.

The thickness of this mounting medium is an important consideration. To thicken, expose to air in a warm place free from dust; to thin, add xylol and stir until dissolved. Balsam that is too thick makes a gummy, darkly-colored mount; if too thin, air bubbles are apt to work in under the cover glass as the contained xylol evaporates. A little experimenting will be necessary to get the average desired viscosity. It should be thick enough to flow readily in a ropy stream from the end of a glass rod and to deliver several fair-sized drops at the end of such flow. It is these last drops that are applied to the tissue on the slide, so that the amount used can be regulated. One large or two small drops are right for most mounts; more for very thick objects.

Because of the fact that it may be put on as a liquid but will later harden to a solid, because of its perfect transparency and because of its high refractive index (1.52), which is the same or but slightly less than that of glass, Canada balsam constitutes an ideal mountant, generally preferred to the many others to be enumerated later. It is also used in photography, as an ingredient in varnishes, and as a cement in the optical industries, especially in connecting the separate lenses of an achromatic lens system in building microscope objectives.

* * *

Historical Outline

Following the period of Roger Bacon there is a lapse of over three hundred years without significant advance in the use of lenses. Then comes an era of rapid development which concerns both simple and compound microscopes as well as the telescope, the history of all three being closely interwoven.

A great deal of research has been made in an effort to trace the original invention of each of these instruments and to immortalize the fame of obscure workers who were groping with the fascinating new idea of magnified vision, but many of the facts have eluded even the most painstaking scholar, and many others are still in dispute. What apparently took place was that a number of persons in widely separated districts, engaged in the grinding of lenses for spectacles, happened by accident to observe images through two lenses, one at each end of a tube, and from such fortuitous beginnings went on to experiment with lens systems. In this installment we will take up the early Dutch inventors and deal with men of other nationalities later.

Charles Singer, who has made one of the most exhaustive studies of the whole question, gives three names as claimants to first honors. Zacharias Jansen (also spelled Janssen and Janseen), born in 1580, was the son of a spectacle-maker of Middelburg, Holland, and was familiar with both convex and concave lenses since these were regularly in use in the spectacle trade. While experimenting with the idea of making a telescope, about the year 1590, he was using a tube said to have been one inch in diameter and six feet long when fully extended. Probably he had two convex lenses, one at each end, the one farthest from the eye being of short focal length. Happening to focus upon a nearby object while extending the tube length, he discovered that the apparent size of the object became greatly increased and from such a chance observation came the development of the first compound microscope.

This type of lens system gave an inverted image. Some historians, as S. H. Gage, believe that Jansen's microscope had a convex objective and concave eyepiece, making an erect image. The point remains unsettled. At any rate, the latter system soon came into use and was known as the Dutch microscope, still with us in the form of the familiar opera glass.

The other pioneers were Jan Lippershey, also a Middelburg spectacle-maker, and James Metius, son of the burgomaster of Alkomar, who in 1608 severally petitioned the Assembly of the States for what we would today term a patent on an instrument for seeing at a distance. These first telescopes were known as spy-glasses and were intended primarily for military usages. The first microscopes were termed flea-glasses, or sometimes fly-glasses, since it became the vogue to observe small insects through them. They call attention to the fact that human fleas were by no means as uncommon among the more cultured classes as in our own day of sanitary enlightenment!

W. A. Locy states that the earliest printed illustrations of magnified objects were a set of fifty plates of insects, engraved on copper, and published by George Hoefnagel in 1592. These had been beautifully drawn by his seventeen-year-old son, Jacob, and some show unquestionably the use of a magnifying glass. Possibly earlier were the illustrations of Mouffet, in his *Theatre of Insects,* also including drawings made with lenses, and prepared in manuscript as early as 1590, but not published until 1634.

* * *

Sources of Supply

In the preceding issue we gave a listing of the principal concerns carrying glassware and chemicals, apparatus and instruments needed by those engaged in scientific work, including microscopy. In this issue we continue this reference list by taking up the biological sources, with leading firms and individuals furnishing living and preserved plant and animal specimens, collecting and storing equipment, prepared microscope slides, entomological supplies, skeletons, models, charts, lantern slides and all the rest of a long roster of subjects needed by teachers of biology in high schools and colleges.

Our readers will be interested mainly in the specimens and slides. The firms starred (*) handle also general apparatus and were included in the previous listing. Of the others, the larger houses carry all or most of the items detailed above and their names appear without further comment. Certain others, including individuals, specialize in a few subjects and do not have a general line. Their specialty is mentioned in each case. The same restrictions as described last month govern the issuance of catalogs; the expensive catalogs of the large houses are sent without charge only to institutions; the smaller dealer, with his price list on a single sheet or postcard, will mail these to anyone on request.

Biological Supply Co., 1176 Mount Hope Ave., Rochester, N. Y.

*Cambosco Scientific Co., Brighton Station, Boston.

Cardevaant Laboratories, 9419 Vernon Ave., Chicago. Slides of frog, chick and pig embryos.

Carolina Biological Supply Co., Elon College, N. C.

*Central Scientific Co., 1700 Irving Park Blvd., Chicago.

*Chicago Apparatus Co., 1735-43 N. Ashland Ave., Chicago.

Coe, Kenneth R., 2024 Sunnyside Ave., Chicago.

Denoyer-Geppert Co., 5235-57 Ravenswood Ave., Chicago.

Forbes, Alden H., Laboratories, 1710 Renton Ave., West View, Pittsburgh. Living and preserved specimens; microscope slides.

Galigher, Albert E., Inc., 1228-30 Solano Ave., Berkeley, Calif. Microscope slides.

*General Biological Supply House, 761-3 E. 69th Place, Chicago.

Gilbert, C. M., Jr., Box 1453 Charlottesville, Va. Preserved animals.

Halsey, H. R., 3804 Greystone Ave., New York. Microscope slides. Protozoan cultures.

*Illinois Biological Supply Co., Inc., Jefferson Postal Station, Chicago.

Kansas City Biological Supply Co., 3605 State Line, Kansas City, Mo. Pig embryos, slides or preserved.

Kauffman-Lattimer Co., 41 E. Chestnut St., Columbus, O.

Marine Biological Laboratory, Supply Dept., Woods Hole, Mass.

Markle, M. S., Earlham College, Earlham, Ind. Preserved material and slides in botany.

*Michigan Biological Supply Co., Dexter, Mich.

*New York Scientific Supply Co., 111-3 E. 22nd St., New York.

Powers & Powers, Lincoln, Neb. Microscope slides.

Southern Biological Supply Co., Inc., 517 Decatur St., New Orleans. Living and preserved specimens and microscope slides.

Southwestern Biological Supply Co., 211 S. Polk St., Dallas, Tex.

*Standard Scientific Supply Corpn., 34-8 W. Fourth St., New York.

Triarch Botanical Products, Ripon, Wis. Preserved material and slides in botany.

*United Biological Service, 159 N. State St., Chicago

Villa Alba Laboratory, Buck Creek, Ind. Living and preserved specimens; microscope slides; cultures.

Ward's Natural Science Establishment, Inc., P. O. Box 24, Beechwood Station, Rochester, N. Y.

*Welch, W. M., Scientific Co., 1515 Sedgwick St., Chicago.

Western Biological Laboratory, University Place, Lincoln, Neb. Living and preserved specimens.

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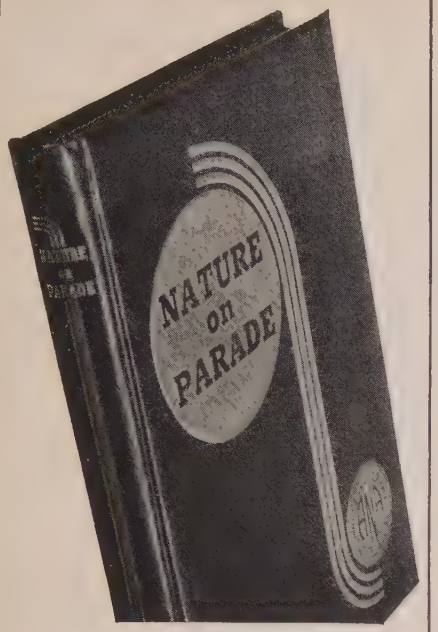

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Diana Thorne's DOG COLUMN

At last year's Cruft's Show in London, among the classes listed as "miscellaneous foreign breeds", there was an astonishing number of new varieties of canines established firmly with the "fancy"; new, that is to say, so far as dog-show officialdom is concerned.

Finsk Spets, red in color and built somewhat on the lines of the spitz; Lhasa Apsos, a Chinese entry in the person of a Shiti Tzu (a shaggy small creature); Pyrenean mountain dogs; Rhodesian Ridgebacks; Rottweilers and Basenjis (natives of the Congo) enlivened the ring and the catalog.

The Basenjis, said to be mute (certainly they were so during the general barking in the arena) would seem to be, in that qualification at least, the ideal dog for the modern city-apartment-dweller!

They are compact and game little fellows

of peculiar beauty. "Basenji" in the Kwango dialect, signifies, in free translation, a "small bush thing". So, there you are!

Then there were more Teutons—the schnauzers, the boxers, and the Dobermann pinschers. These, of course, were not to be considered debutantes. It is of the Dobermanns I will speak here, but let me digress for a moment in thought before this array. It is an intriguing point that the cat, alone of the domesticates, would appear to be the only animal that has NOT become the subject of a major industry! That is curious. There are, of course, cat-breeders. I am speaking comparatively. Aloof and cynical, self-sufficient and introspective, asking little of humanity and receiving scant consideration and often positive dislike, she walks alone today even as she did with Ptolemy.

Of the human species, the varieties have remained fairly constant in form since the beginning of time, but new varieties or types of canines are bred and produced for inspection every year or so. And so to the Dobermann.

Just why Herr D. should have believed (if he did) that he could produce through cross-

(Continued on page 127)

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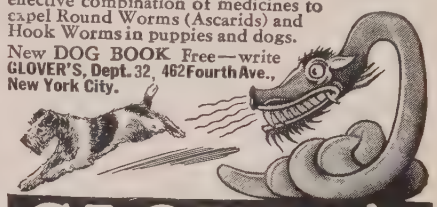

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Cleveland's Nature Trails

Earlier in the year we carried a note descriptive of the excellent loose-leaf Nature booklet being compiled under the title of *Cleveland's Nature Trails,* edited by Omar Ranney and available from the public service bureau of the *Cleveland Press.* Many of our readers were interested in this and orders for the booklet were received from twenty different states. Since this project is seasonal in character, ten additional leaflets have been added and are now available. These additions cost five cents. The complete booklet, including the new sheets, now sells for fifteen cents. Again congratulations to the *Cleveland Press* for this worthwhile contribution to Nature knowledge.

The River

The second major documentary film made by the Federal Government to dramatize America's social and economic problems recently has been released by the Farm Security Administration. The title of this new film is *The River,* and it is the story of the far-reaching effects brought about by man's misuse of the land drained by the Mississippi River. The film story begins in the upper reaches of the Mississippi at Lake Itasca, Minnesota, and traces the expanse of the Father of Waters to its mouth in the Gulf of Mexico. The story of cotton, which brought wealth to the South while impoverishing tenants and sharecroppers, is portrayed, as is the story of impoverishment of land on the timber front farther north. Improper cutting methods result in too-rapid run-off of water and floods, the picture reveals, and the flood of 1937 climaxes the presentation. After the floods have receded, the even greater toll of water is revealed—the toll that continues year after year as millions of tons of fertile topsoil are washed down to the sea. The picture concludes with the presentation of the work the Government is doing to make the river work for man instead of against him, featuring the gigantic flood control and power projects now being undertaken by the Tennessee Valley Authority. It goes without saying, of course, that the flood sequences of the film were made with great risk, and much credit is due cameramen Floyd Crosby, Stacey Woodward and Willard Van-Dyke. Although the film was completed in January, 1937, these men returned to the basin to shoot scenes of the flood of last spring, one of the worst in America's history. Well worth seeing, *The River* undoubtedly will be shown at several thousand theatres throughout the country this year.

Fortunes From Federal Forests

According to a report recently issued by the U. S. Forest Service, National Forests earned more than $1,200,000 during the first quarter of the present fiscal year, an increase of more than $227,600 over the same period last year. This income was mainly derived from timber sales, grazing fees and special uses. The forests, second only to the National Parks in recreational popularity, are visited by twenty-five million persons each year free of charge for all forms of outdoor enjoyment such as camping, hiking, saddle trips, swimming, game study and winter sports.

On Eastern Ferns

Guide to Eastern Ferns, by Edgar T. Wherry, is a little volume that is especially valuable. No book that we have seen combines in so small a space, and so authoritatively, and fully, the information that the amateur student wishes to know about our eastern ferns. Since ferns range more widely than almost any class of plants, several species that inhabit most of North America, and even extend to Eurasia and South America, are here treated.

The more important facts relating to each species, under History, Features, Habitat, Range, and Remarks, occupy the right hand pages; on the facing page appears a line drawing. The nomenclature is simplified; thus the names, with few exceptions, will be recognized by anyone who has dipped, even lightly, into fern study; one exception is *Asplenosorus ebenoides,* a hybrid between the ebony spleenwort and the walking fern. This was named by the author in the *American Fern Journal* in the spring of 1937.

We rejoice that the author has included the fern-allies, the club-mosses and horsetails, in his treatment. He also devotes several pages to fern-cultivation. Under this head all species are classed as to soil and habitat preferences, and references to pages are given, thus supplementing the index of genera that occupies the final page. Altogether about one hundred species are treated on 220 pages. Yet the bound volume measures only 7 x 4 x ½ inches, thus slipping easily into one's pocket.

It is available from the publishers, the Science Press Publishing Company, Lancaster, Pa., for one dollar, plus postage. E. A. P.

Is Your Dog Ready?

Science has shown us that certain vitamins are essential in our daily diet to keep us in the best of health. But how about your dog? Your pet needs these health-giving vitamins also, especially now that the winter season, when most pets are confined to the house, is upon us. If you are interested in a booklet that explains the function of these vitamins, ask the Dog Editor for your copy. It's free.

Of All the Places

The 1937 Year Book of the Indiana Audubon Society reports an instance where a Carolina wren built her nest in a clothespin apron, full of pins, that was hanging in a workroom at the rear of Cleo H. Wesner's kitchen. Unafraid of the inhabitants, the bird laid six eggs and hatched them all successfully. The Year Book is available from the Society, 915 West Gilbert Street, Muncie, Indiana, for $1.00.

Bird Guide Ready

The Cranbrook Institute of Science announces publication of *A Pictorial Guide to the Families of Birds,* by Edward T. Boardman and Elizabeth Barto. This excellent pamphlet, containing 74 figures and more than 40 pages of instructive text, will enable the neophyte naturalist to recognize the family to which most of our birds belong. The pamphlet, which presents also a list of the birds of southeastern Michigan, is available from the Institute at Bloomfield Hills, Michigan, for fifty cents, cash or stamps.

DIANA THORNE'S DOG COLUMN

(Continued from page 125)

breeding a better watchdog than the German shepherd who, through the centuries, had demonstrated his exceptional abilities if not supremacy in that province, I do not know, nor do I think that was really his one idea!

I prefer to believe that he was a shrewd speculator who, at the end of last century, watching a rising market, perceived the "fancy" section of it, particularly the trans-Atlantic portion, was open and ready to accept and enthuse over a new breed! If so, in this he was right.

However he managed it, Herr Dobermann undoubtedly succeeded in producing a definite type and a very fine one, and whatever might be his reasons for enterprise in cross-breeding, the result justified him and incidentally placed him in a niche of greater honor than that afforded by his previous trade.

The bench Dobermann of this day is a beautiful creature.

The March of the Marigold

(Continued from page 88)

class, and the petunias and larkspurs to the cyanic. It may be, after the manner in which various characters of the marigold are inherited have been more closely studied, that white or pink flowers will be produced on plants that have stems of a desired length and that bloom sooner.

Marigolds have always added color to gardens but for many years they were not greatly admired, and were seldom used as cut flowers. Now they have advanced to the front ranks. The flower of the African has been increased in size from two inches across to five to seven inches. The attractively crinkled blossoms of the Gigantea Sunset Shades Marigolds are enormous. In plant form and manner of flowering there have been many changes. Some are compact, others five feet tall, and others form dwarf cushions of color. The flowers of Golden Crown almost completely hide the foliage with their bright yellow heads. No longer does it take four or five months for marigolds to flower. Some are even forced in greenhouses for cut flower arrangements. Little did the wandering seaman who was first attracted by the charm of marigolds dream of the changes that would take place, but it is no wonder that marigolds are still increasing in the wide popularity to which he introduced them.

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BULLETINS FOR MEMBERS

A limited number of American Nature Association Bulletins of an early series are still available to members for a three-cent stamp each to cover the cost of mailing. These are:

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Of the new series of bulletins the following are available to members for a three-cent stamp and to non-members at ten cents and twenty-five cents respectively.

No. 2—Our Disappearing Fur Bearers.
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Other Association bulletins are in preparation. Send your request, with necessary stamps, to:

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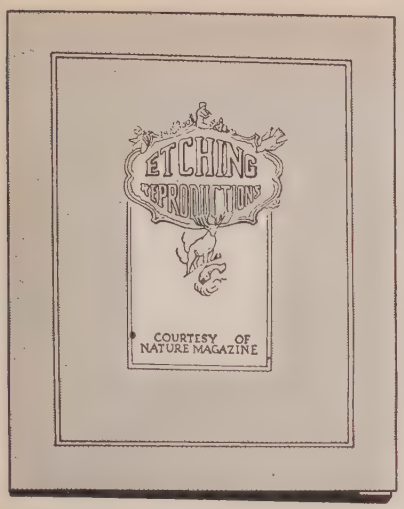

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Among Our Authors

Charles Shelton (To the Land of the Cirio) is a young California newspaperman whose favorite diversions are mountain pack trips and jaunts into the desert. He is a native of southern California, and a graduate of Pomona College. The article in this issue is a by-product of a trip of two months' duration made into Lower California with Hulbert Burroughs, who took the pictures. They drove the entire length of the peninsula in an old Ford pick-up.

Clay Perry (Ten Thousand Bats) is a native of Wisconsin but now lives in Pittsfield, Massachusetts, where he is outdoor editor of the *Berkshire Evening Eagle*. He became interested in caves and old mines, and, while exploring, became acquainted with the bat-banders whose work led them into such localities. Mr. Perry has completed a book to be entitled *Underground New England* and which is scheduled to appear this spring. He is active in the campaign to check pollution of streams, and is the author of many magazine articles and stories, and one historical novel, *Hell's Acres*, in collaboration with John L. E. Pell.

Ernst Schwarz (The Story of the Horse) is a distinguished German zoologist who has specialized in the study of mammals. Formerly associated with the Berlin Zoological Museum in Germany and the British Museum in London, he is now at the United States National Museum in Washington, D. C.

Wolfgang Von Hagen (Galapagos Enemies) was born in St. Louis but was educated in Europe. He has travelled widely and has studied, from a naturalist's point of view, the head hunters of the Amazon. He is actively interested in having the Galapagos Islands established as a sanctuary in memory of Charles Darwin.

Exploring as a Career

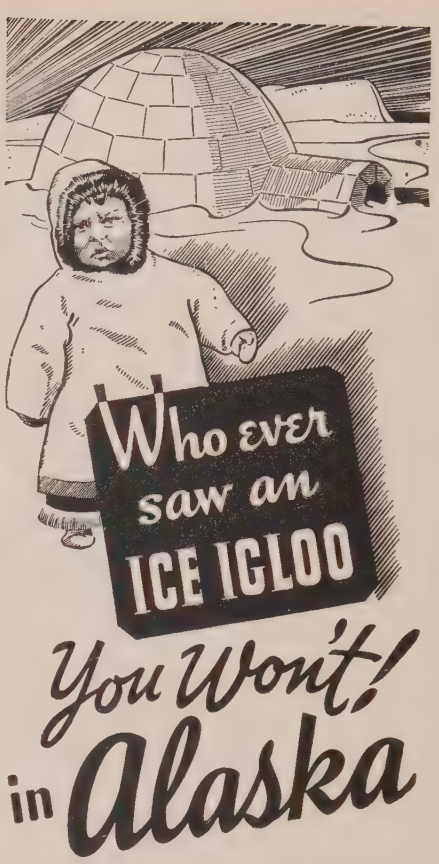
This is the title of a monograph just issued by The Institute for Research, 537 South Dearborn Street, Chicago, Illinois. This organization is devoted to vocational research, and in this brochure it presents a picture of the past, present and future of exploration, its various specialities and its significance as a career. Copies may be obtained from the Institute at one dollar each.

Bulbs in Color

Those who specialize in bulb plants will find joy in *Garden Bulbs in Color* just issued by Macmillan. It is the joint work of J. Horace McFarland, R. Marion Hatton and Daniel J. Foley. Presenting 275 color pictures of flowering bulbs and accompanying descriptive text, this book should find a wide audience among gardeners. It is available at $3.50.

Recreation Conference

Outdoor leadership in recreation and conservation will be the keynote of the Nature section of the annual Outdoor Recreation Conference to be held by Massachusetts State College at Amherst, Massachusetts, March 10 to 13.



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Photographic Notes

BY SAMUEL BROWN

MARCH OFFERS BEAUTIFUL SKY AND CLOUD EFFECTS. PICTURE TAKEN AT F.8 WITH K2 FILTER, 1/100 OF A SECOND ON PANATOMIC FILM

Coloring

Objects photographed are, as a rule, colored. When reduced to a black and white print they are attractive, but they could, in many cases, be greatly improved by the addition of some color. This improvement may be accomplished by toning. This is a chemical process that changes the black silver image to a colored one. Chemicals for this purpose are put up ready for use. Where the subject calls for general coloring water and oil color sets are available for this purpose. This month we make some suggestions for making our pictures more attractive by such methods.

When either toning, or otherwise coloring, careful attention is necessary in making the prints or enlargements. The paper to be used should preferably have a matte or semi-matte surface. It should be so exposed that it will develop fully, be properly fixed and thoroughly washed. Poor prints will not give good results. Before toning all solutions should be prepared as directed and the print immersed for the length of time suggested. It is then carefully washed and dried in a place free from dust.

Many unusual effects are possible when using solutions to give two or more different colors. The multiple toning is accomplished with the aid of a spirit varnish that is used to cover those portions of the print not intended to take the color of the particular toning bath in use. Let us assume that the colors chosen are sepia and green. Apply the varnish with a camel's hair brush to those parts that are not to be toned sepia. When the varnish dries proceed with the sepia toning in the usual way, dry the print and remove the varnish with some cotton dipped in alcohol. Next use the varnish on those parts not to be toned green and proceed again in the manner described above, this time with the green solution. Many interesting effects are possible by using any number of different toners. After toning, prints may be touched up in places with regular photo colors where the subject demands such treatment.

Coloring with water or oil colors does not require unusual skill with the brush. No extra equipment is needed besides the colors and prints, except for some blotters. When using water colors the print should be slightly damp. For oil colors, the pictures should be surfaced with the special medium supplied with the set. The beginner should choose a simple subject such as a landscape or seascape. Portraits are more difficult and should be left until sufficient skill is acquired.

Prints with shadow detail are best for coloring. Deep blacks should be avoided. Flat prints will give washed-out results, while contrasty ones show black areas lacking in color. Be sure to keep the print free from any dirt, otherwise the colors will not take evenly.

Colors are easy to control if they are weak or dilute. Density may be built up to the desired shade by successive applications. All work should be done in daylight, or under mazda light giving daylight quality illumination. Clouds may be worked into a blank sky by coloring with blue and leaving blank spaces of white. If water colors have been applied too thickly they may be softened by gently rubbing with a tuft of cotton moistened with water or by washing with some neutral color such as gray. In cases where it is desired to remove all of the color, this may be done by soaking the print for a few moments in a weak ammonia solution and then washing.

Some points to remember are not to overcolor a picture. Avoid clashing color contrasts. Large areas do not require the use of a brush. A tuft of cotton serves in almost every case, while smaller ones may be done with a bit of cotton on the end of a pointed stick. Only fine detail should be added with a brush. In landscapes color all the large spaces working into the smaller ones. For distant hills and mountains use tints of purple and blue; for trees a blue green; grass and leaves in the foreground light green, working in yellow spots in places and deep green in others. Fall coloring is represented by raw sienna, and sunlit spots by yellow. The secret of evenness in oil coloring is originally to apply the colors in sufficient quantity so that all excess can be wiped off leaving a perfectly even film of color of the correct depth.

SOME FRIENDS OF THE WOODS. TAKEN AT F.6.3, 1/100 OF A SECOND, S. S. PANCHROMATIC

* * *

Developing

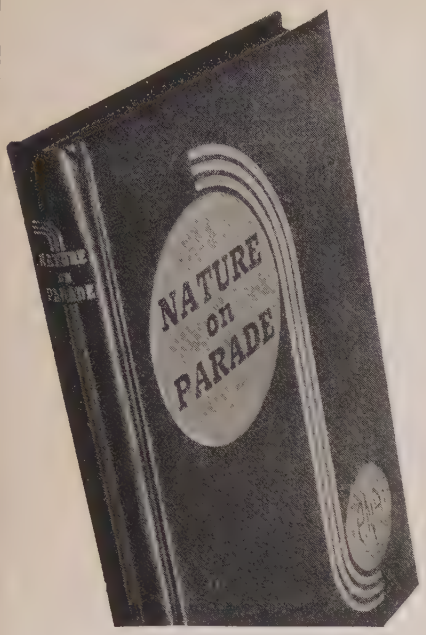
During the past two months we have discussed the most commonly used methods for developing films. It is of interest to know exactly what takes place during the developing process; what chemicals are used and why. In this way a clearer understanding and greater appreciation may be had.

When the film is exposed in the camera, the emulsion quickly undergoes a change. Exactly what happens is not known, but the opinion is that there is a tendency toward reduction of the silver compounds to metallic silver. Where the light is strongest, this tendency is more pronounced. It is the purpose of the developing solution to continue this reduction to free silver and, therefore, some chemical is used that has the power of liberating free silver from its salts. Such substances are known as reducing agents.

Some reducers in common use today are metol, elon, pyro and hydroquinone, each having its own characteristics. Because reducing agents combine readily with oxygen, a chemical must be used that will absorb all of the oxygen so that the developing agents can work readily. As a rule sodium sulphite, which takes no part in the actual development but serves merely as a preservative, is used.

An alkali is also desirable in the developer in order to swell the gelatin and allow the reducer to reach all of the silver salts. For this purpose sodium carbonate is generally used. If too much alkali is used the emulsion swells excessively and the developer becomes over-active so that it decomposes all of the silver and causes fog.

In order to permit the use of sufficient sodium carbonate without fogging the film, some substance must be used to prevent complete reduction by the developing agent. In other words the developing agent must be restrained and made selective so that it will reduce only those parts affected by light. The



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addition of a chemical such as potassium bromide has this effect. It increases the selectivity of the developer and permits the use of a greater amount of carbonate to increase the speed of development.

A developing solution, therefore, should contain the following ingredients: a reducing agent; a preservative; an alkali to permit the developing agent to act, and the restrainer to make it selective. These different chemicals must be mixed in their proper proportions in order to achieve certain results. For general use only two different developers are necessary: one for fine grain results on negatives and the second for making prints and enlargements. The formulas for these developers are given below. Be sure to dissolve the chemicals in the order given.

D-76 for fine grain negatives.

Water (about 125 degrees F.)	96 ozs.
Elon (Metol)	116 grains
Sodium Sulphite	13¼ ozs.
Hydroquinone	290 grains
Borax	116 grains
Water to make	1 gallon

D-72 for prints and enlargements.

Water (about 125 degrees F.)	16 ozs.
Elon (Metol)	45 grains
Sodium Sulphite	1½ ozs.
Hydroquinone	175 grains
Sodium Carbonate	2¼ ozs.
Potassium Bromide	27 grains
Water to make	32 ozs.

For contact prints use stock solution 1 part; water 2 parts.

For enlargements use stock solution 1 part; water 4 parts.

* * *

Trade Hints and New Books

Modern Photographic Development is a new booklet that will appeal to every amateur. Describing a versatile line of photographic chemicals, it also gives many valuable hints on developing, printing, toning, intensification and reduction. Illustrated with several beautiful photographs and one color picture. Get your copy by writing this department.

* * *

The Intercontinental Marketing Corp., 10 E. 40 St., New York, N. Y. announce a new exposure meter. Called the *Photorix,* this meter operates on the photo electric cell principle. It is one of the most compact instruments of its kind and operates with extreme accuracy. You will want to know more about this exposure meter and Intercontinental will be happy to send full details. Be sure to mention *Nature Magazine.*

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Owners of the 3 A Kodaks, Series II can now cut their picture-taking costs in half by using a new back recently designed by the Eastman Kodak Co., Rochester, N. Y. This back can be installed by any good mechanic and provides two windows and a special mask permitting two pictures of half size to be made on a regular single 122 film.

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The photographic department of *Nature Magazine* is edited for its readers interested in photography and maintains a service that renders assistance with any photographic problem. You are invited to take advantage of this service. Address all photographic inquiries to Samuel Brown, Nature Magazine, 1214 Sixteenth St., N. W., Washington, D. C.

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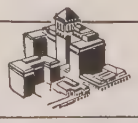

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ANNUAL VINES

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Victor H. Ries

Whether you rent or own your home, annual vines can be used for mid-summer bloom after other vines, such as roses, have ceased blooming.

The present vogue of Heavenly Blue morning glory is easily explainable after one sees it in bloom. Try a few in among your climbing roses, with your wisteria or bittersweet vine for summer color. They may even be grown as pot plants in 12-inch tubs or painted flower pots with three-, six-, or eight-foot bamboo poles for them to climb on. In this way they will bloom profusely all summer. Regular watering, however, is necessary.

The cardinal climber and cypress vine, with their bright red flowers and finely cut leaves, may be used in exactly the same way. Another vine worth trying, both for garden decoration as well as cut flowers is the hyacinth bean, variety Darkness. Its lavender flowers and purple seed pods harmonize with almost any other color. Try it on pergolas, fences, porches, or trained up tree trunks.

Even more brilliant, but more difficult to use is the Scarlet Runner bean. Incidentally, its beans, following its bright scarlet flowers, are excellent for green beans for the dining table. For night bloom one may use the moonflower, with its gorgeous white flowers, and for day bloom its cousin, the Japanese morning glory.

These are but a few of the common and better annual vines which are listed in practically every seed catalog. Remember that annual vines climb by tendrils or by twining so that a few strings or wires are necessary as support, unless some woody vine is handy for them to use as a support.

Yosemite School

Preparations are now being made for the fourteenth session of the Yosemite School of Field Natural History to be held this summer from June 20 to August 6 in Yosemite National Park. A distinguished staff drawn from nearby universities and Park Service personnel will share in the instruction which is conducted primarily in the field. One week will be spent on a Park Research Reserve project and two weeks on a back-country pack trip for the study of flora, fauna and geology of the High Sierra. This school is maintained each summer by the government. Its graduates are chosen for ranger, ranger-naturalist, custodian and park naturalist positions in National Parks and Monuments.

Fourteen men and six women possessing the requisite training and experience in natural sciences are to be selected. College graduation, or the equivalent, is required. Majors in the science field are preferred. No tuition fee is charged and cost to the student involves travel to Yosemite and incidental camping expenses. Write to C. A. Harwell, Park Naturalist, Yosemite National Park, Director of this School, for an application blank and prospectus.

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Indoors and Out

By HOWARD ZAHNISER

My very considerate friend Colonel H. P. Sheldon tells me that his young son once received a diary for Christmas. With other accumulations of that merry season it disappeared into the haunts sacred to the boy and remained there practically forsaken. Some months later it came to the attention of the one in the home who is a privileged character even in "dens", and she showed it to the Colonel. Careful examination revealed one entry —and only one. It was for March 14: "Today I wisht it wus summer."

What prompted the entry is still one of the mysteries in that home. Perhaps it was the subtle influence of what the Indians called the "wakening" moon in their calendar of the months. Perhaps it was the same uncontrollable anticipation that the poet Spenser thought of when he wrote:

> And when the shining sun laugheth once
> You deemen the spring cometh at once.

Certainly in his own terms the boy knew as well as James Thomson did, that—

> As yet the trembling year is unconfirmed,
> And Winter oft at eve resumes the breeze.

The best that he could do was to wish, and the rest of his year's diary shows well that he did that as strenuously as the winds blow in March.

> And a verse of a Lapland song
> Is haunting my memory still:
> "A boy's will is the wind's will
> And the thoughts of youth are long, long thoughts."

I wonder how many of us, if we were frank, would join young Sheldon in wishing that March would be summer. Certainly not all of us would. Maurice Thompson once wrote of his sojourns in the Southland, where Chambers of Commerce at least would have us believe it is always summer, that "when a green wave of exploding buds and rapidly developing leaves rolls gently northward, beginning late in March" he always wished to migrate northward to Spring, if necessary using fast trains "when the springtide makes a flower-sprent dash, or when the migrant songsters put on a spurt of speed here and there." He, at least, seemed to prefer spring in his own Indiana, possibly knowing, like Shakespeare,—

> How many things by season seasoned are
> To their right praise and true perfection!

Perhaps, though, most of us deep in our hearts like March because we enjoy wishing for summer, enjoy seeing the prophetic evidences on every hand, as much for what they mean as what they are. John Burroughs delighted in the bluebird, saying that "it is sure to be a bright March morning when you first hear his note," but then the Sage of Slabsides ascribed the brightness in part to the fact that the song is "so prophetic." In the city the daffodils in the florist's shop are a part of my recollection of March. Shakespeare in England wrote of—

> Daffodils
>
> That come before the swallow does, and take
> The winds of March with beauty.

At San Juan Capistrano mission in California the swallows—or so many people believe—arrive invariably on March 19, and in numbers large enough to make a spring. I can vouch for the fact that daffodils reach the florist's shop before that, even in Washington, D. C., though what that might mean about March in the language of the flowers I am not sure.

I chanced not long ago to acquire an English book entitled *The Romance of Nature; or The Poetical Language of Flowers,* by Thomas Miller. The title-page carries no date, but the volume is inscribed "Sophie Ridgely, from her friend, Wm. Gordon. Christmas 1869." The figure may even be "1849." The American preface says that Shakespeare would have christened daffodils "Trustfulness, as trembling into life and loveliness despite the bleakness of March." Yet the book itself in its catalog of the language of flowers translates "daffodil" into "Deceitful Hope," and this seems more in harmony with the implications of the testimony of our youthful diarist.

I wonder what the wild creatures think—or better, feel—about March. I know that, like Shelley, we are accustomed to considering it peculiarly human to

> . . . look before and after,
> And pine for what is not

and yet I think too that perhaps we may underestimate the degree to which we share experiences with other creatures. It seems that only the poets like Wordsworth will actually express a

> . . . faith that every flower
> Enjoys the air it breathes.

Even with such a faith it is indeed difficult in a matter-of-fact way to think of the *Symplocarpus* actually enjoying the marshy air, and impossible to think of its enjoying the foul misnomer of skunk cabbage. The early saxifrage, if it enjoys the air it breathes in its dry and rocky places, must find March a bit bleak. Yet the trailing arbutus does actually have an air of demure contentment on the forest floor under leaves that have been "kind" all winter, though I suppose the thought occurs to one because he himself finds the fragrance of the arbutus so suggestive of contentment. After all, summer has nothing like the arbutus aroma.

There is even a greater likelihood of our having a common feeling with the bumble-bee or the mourning-cloak butterfly, still more with the chipmunk, I think, and men have often identified themselves with the birds in spring. March must look quite satisfactory to a mourning-cloak after a winter in a hollow log. I am not so sure about the bumble-bee. Only the female survives the winter, and as she goes about among the few March flowers preparing the way for the (Continued on page 192)

"SOME ARE STRAIGHT AS SCHOONERS' MASTS; OTHERS HAVE TWISTED OVER IN A NATURAL ARCH UNTIL THEY TOUCH THE EARTH WITH TIP AS WELL AS BASE," WRITES THE AUTHOR. THE TENDENCY OF MOST IS, HOWEVER, DEFINITELY UPWARD, ALTHOUGH STRONG WINDS AND SUDDEN, TORRENTIAL RAINS MAY HELP IN THE BUILDING OF WEIRD FORMS, AS WITH THIS ONE